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Headquarters
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DIVISION ENGINEER COMBAT OPERATIONS
(Digital - Coordinating Draft)

1. Change FM 5-71-100, 22 April 1993, as follows:

Remove Old Pages	Insert New Pages
i through iii	i through iv
1-1 through 1-6	1-1 through 1-6
1-9 through 1-16	1-9 through 1-20
2-1 through 2-14	2-1 through 2-14
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A-1 and A-2	A-1 and A-2
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Glossary-1 through Glossary-15	Glossary-1 through Glossary-27
References-1	References-1 and References-2
Index-1 through Index-4	Index-1 through Index-8

2. A bar (|) marks new or changed material.

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No. 5-71-100

HEADQUARTERS
DEPARTMENT OF THE ARMY
Washington, DC, 22 April 1993

DIVISION ENGINEER COMBAT OPERATIONS
(Digital - Coordinating Draft)

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PREFACE

Field Manual (FM) 5-71-100 is the capstone manual for engineer support to division operations. It is designed as an engineer extension of FM 71-100. This manual serves as a guide for division engineers, their staffs, and subordinate commanders in planning, integrating, and conducting engineer operations to support a division. It also serves as a guide for the division staff and subordinate maneuver commanders on the organization, capabilities, and employment of engineers as a division combat multiplier. Finally, this manual provides corps-level engineer commanders with the principles of division engineer operations effecting their integration into division engineer operations.

This manual applies to all types of divisions and their organic engineers including the Force XXI (FXXI) divisions. It sets forth principles which guide the conduct of engineer operations supporting the division. This manual addresses engineer tactics, techniques, and procedures (TTP) as necessary to emphasize critical principles. These TTP include digital TTP identified during the Division XXI Advanced Warfighting Experiment (DAWE) to emphasize critical changes in operating procedures. However, the TTP are intended to be descriptive rather than prescriptive and are not a replacement for the TTP and standing operating procedures (SOPs) unique to the supported division.

FM 5-71-100 is fully compatible with Army doctrine as contained in FM 100-5 and is consistent with other combined arms doctrine. This is not a stand-alone manual. The user must have a fundamental understanding of the concepts outlined in FMs 100-5, 100-15, 71-100, 101-5, 101-5-1, and 5-100. This manual also implements Standardization Agreement (STANAG) 2394, Land Force Combat Engineer Doctrine, Edition 1, and STANAG 2868, Land Force Tactical Doctrine, Edition 4.

The proponent of this publication is Headquarters (HQ), United States (US) Army Engineer School. Send comments and recommendations on Department of the Army (DA) Form 2028 (Recommended Changes to Publications and Blank Forms) directly to Commander, US Army Engineer School, ATTN: ATSE-TDM-P, Fort Leonard Wood, Missouri 65473-6650.

Unless this publication states otherwise, masculine nouns and pronouns do not refer exclusively to men.

NOTE: The FXXI TTP included in this manual do not address light infantry operations

CHAPTER 1

Engineer Operations and the Division Battlefield

The division is the US Army's largest, fixed organization that trains and fights as a tactical team. It is organized with various combat, combat support (CS), and combat service support (CSS) units that make up the combined arms team. A division may be armored, mechanized infantry, light infantry, airborne, or air assault. It is a self-sustaining force capable of independent operations, even for long periods of time, when properly reinforced. Each type of division conducts tactical operations in a low-, mid-, or high-intensity environment. The division force structure may be either digital, analog, or a mix of both. The FXXI division covers more battle space, conducts operations at greater depth, and is more lethal than an analog division. Divisions are the basic units of maneuver at the tactical level.

The ERI division engineer organization (DIVEN) focuses on maneuver at the tactical level. Division engineers, both analog and FXXI, execute mobility, countermobility, survivability, topographic, and limited sustainment engineering missions to support maneuver in the division area. The division engineer integrates nonorganic and corps engineer assets into the division to augment these capabilities as the battlefield dictates. The structure of division engineers allows them to fight as part of the division's combined arms team.

DIVISION BATTLE SPACE

FM 100-5 defines battle space as a physical volume that expands or contracts in relation to the ability to acquire and engage the enemy. It includes the breadth, depth, and height in which the commander positions and moves assets over time. The FXXI division's battle space has greatly increased over that of the analog division. It can now cover an area of approximately 250 by 250 kilometers, roughly the same space as an analog corps would cover in the 1990s. The FXXI division brings to the battlefield greater intelligence-gathering capabilities through a multiple array of digital ground, airborne, and space-borne systems and sensors. The Assistant Chief of Staff, G2 (Intelligence) (G2) of the FXXI division can pull intelligence information via digital linkages with national, strategic, and tactical databases. Airborne systems such as the unmanned aerial vehicle (UAV), Joint Surveillance Target Attack Radar System (JSTARS), Advanced Quickfix (AQF), and other airborne systems can detect an enemy force at ranges up to 400 kilometers or more. Using long-range artillery fires (Crusader, Multiple Launch Rocket System [MLRS], RAH-66 [Comanche], or Longbow Apache [LBA]), enemy forces can be attacked in depth. Because of the FXXI commander's enhanced situational awareness (SA) capabilities and his maneuver force's ability to conduct precision movement, he can mass combat power at a time and place of his choosing and launch surprise attacks where the enemy least expects them.

ROLE OF DIVISION ENGINEERS

Division engineers in an analog division serve two critical roles for the division. First, they provide engineer expertise at every echelon of command from the division to the company or team. Second, they provide the structure necessary to command engineer units at these echelons. Both of these roles involve the five engineer battlefield functions: topographic, mobility, countermobility, survivability, and general engineering. As a combat multiplier, engineer units focus on maintaining the division's freedom of maneuver and attacking the threat's freedom to maneuver on the battlefield. As part of the division staff, the division engineer focuses on integrating and synchronizing engineer missions to support the division commander's intent and scheme of maneuver.

In the FXXI division, the engineer brigade headquarters is replaced by an engineer cell residing as mobility/survivability elements in the division TAC, G3 main, and division engineer section in the division main. This staff is focused by the division engineer to form an organic division staff engineer section (DSES). The division engineer provides the division commander with planning, integration, and synchronization of engineer operations in the deep, decisive, and sustaining fight. The division engineer's knowledge on maneuver and force integration allows for effective force couplement of EAD engineer forces as mission enhancements. This includes the acquisition and management of information, the maintenance of situational understanding, and estimates on the direction and leading of subordinate forces.

The mobility/survivability element of the division TAC is comprised of chemical and engineer personnel. Their function is the enhancement the division's mobility and the degradation of the enemy's mobility. This element is also concerned with the survivability of the division by avoiding or at least minimizing the effects of weapons of mass destruction. The mobility/survivability element—

- Monitors, directs, and coordinates the activities of chemical and engineer units.
- Has an embedded engineer team that conducts reconnaissance to continuously update the division knowledge base to ensure that the RCP accurately reflects all obstacles (both friendly and enemy) and trafficability information concerning the area of operations.
- Has engineer and chemical elements that work closely with the G2 and FSE to track and plot known obstacles.

The G3 mobility/survivability element in the division main consists of three distinct sections – engineer, chemical, and the provost marshal (PM). The cell is overall concerned with mobility (both friendly and enemy), and survivability (protection) of the force. The engineer section—

- Prioritizes and recommends the allocation and task organization of divisional engineer assets and other engineer units received from EAD.
- Assists the plans team as they develop OPLANs and OPORDs by recommending appropriate use of engineers and providing detailed knowledge of their capabilities and limitations.
- Assists the G2 section of the IPB cell and the G2 plans officer with the terrain analysis portion of the IPB.
- Maintains an accurate status and location of all friendly and known enemy obstacles, along with impediments to movement caused by current weather or terrain.
- Advises and coordinates with the division engineer for the planning and execution of rear-area mobility, survivability, and sustainment engineer tasks.
- Provides "terrain visualization" through the use of the Digital Topographic Support System (DTSS) and TerraBase. Terrain products are viewed while developing or analyzing COAs and enhance the division commander's ability to make informed battlefield decisions

In the FXXI division, the engineer section can electronically move and share information with subordinate and higher units. This allows rapid synchronization of operations and dissemination of orders. Each of these processes is complemented by the use of the Maneuver Control System-Engineer (MCS-ENG), FXXI battle command brigade and below (FBCB2), All-Source Analysis System-Remote Workstation (ASAS-RWS), Digital Topographic Support System (DTSS), Raptor Intelligence Combat Outpost (ICO) control stations, and Land Warrior. As part of the division staff, the division engineer section focuses on integrating and synchronizing all engineer missions to support the commander's intent and scheme of maneuver. Engineers of both FXXI and analog divisions provide engineer expertise at each echelon of command and provide planning and synchronization for engineer operations in support of the maneuver commander's intent and the scheme of maneuver.

ENGINEER ORGANIZATIONS

DIVEN organizations are specifically tailored to provide the support necessary to complement the division's capabilities and employment.

Armored and Mechanized Infantry Divisions

Armored and mechanized infantry divisions (henceforth discussed together under the term *armored division)* provide mobile armor-protected firepower. They destroy threat armored forces and seize and control land (including population centers and resources) with long-range and flat-trajectory fires. Armored divisions operate best in relatively open terrain where they can use mobility and long-range, direct-fire weapons to their best advantage. The armored division typically has three ground-maneuver brigades (consisting of tank and mechanized infantry battalions) and an aviation brigade.

The analog and limited conversion armored division has an organic engineer brigade consisting of three mechanized engineer battalions and a headquarters and headquarters detachment (HHD). Each battalion is normally associated with a ground-maneuver brigade. The DIVEN HHD provides centralized C2 and planning for the total division engineer effort. The DIVEN commander task organizes division engineer companies and corps assets into forward combat engineer battalions. Each battalion habitually trains and operates with its associated ground-maneuver brigade. The DIVEN commander may detach companies from one battalion to another division engineer battalion (main effort) or to another maneuver unit (cavalry [CAV] squadron). Figure 1-1 shows engineers organic to the armored division and the generic engineer task organization for division defensive and offensive operations.

In the FXXI division, there is no longer an organic engineer brigade consisting of three mechanized engineer battalions and an HHD. The engineer brigade and its headquarters and headquarters detachment was replaced by an organic mobility/survivability staff element in the division headquarters and three mechanized engineer battalions now organic to the maneuver brigades. The division staff engineer section (DSES) within the division staff is a collective element of engineers focused by the division engineer. Even though the division engineer does not have command and control authority, he provides the division commander with estimates and recommendations for the direction of engineer forces both organic or in a command and support relationship. Engineer battalions that were habitually associated with a maneuver brigade are now organic to the division and assigned to the maneuver brigade. FXXI division henceforth refers to a reorganized armored division with digital equipment and systems. Figure 1-1a, page 1-3b shows a FXXI division laydown.

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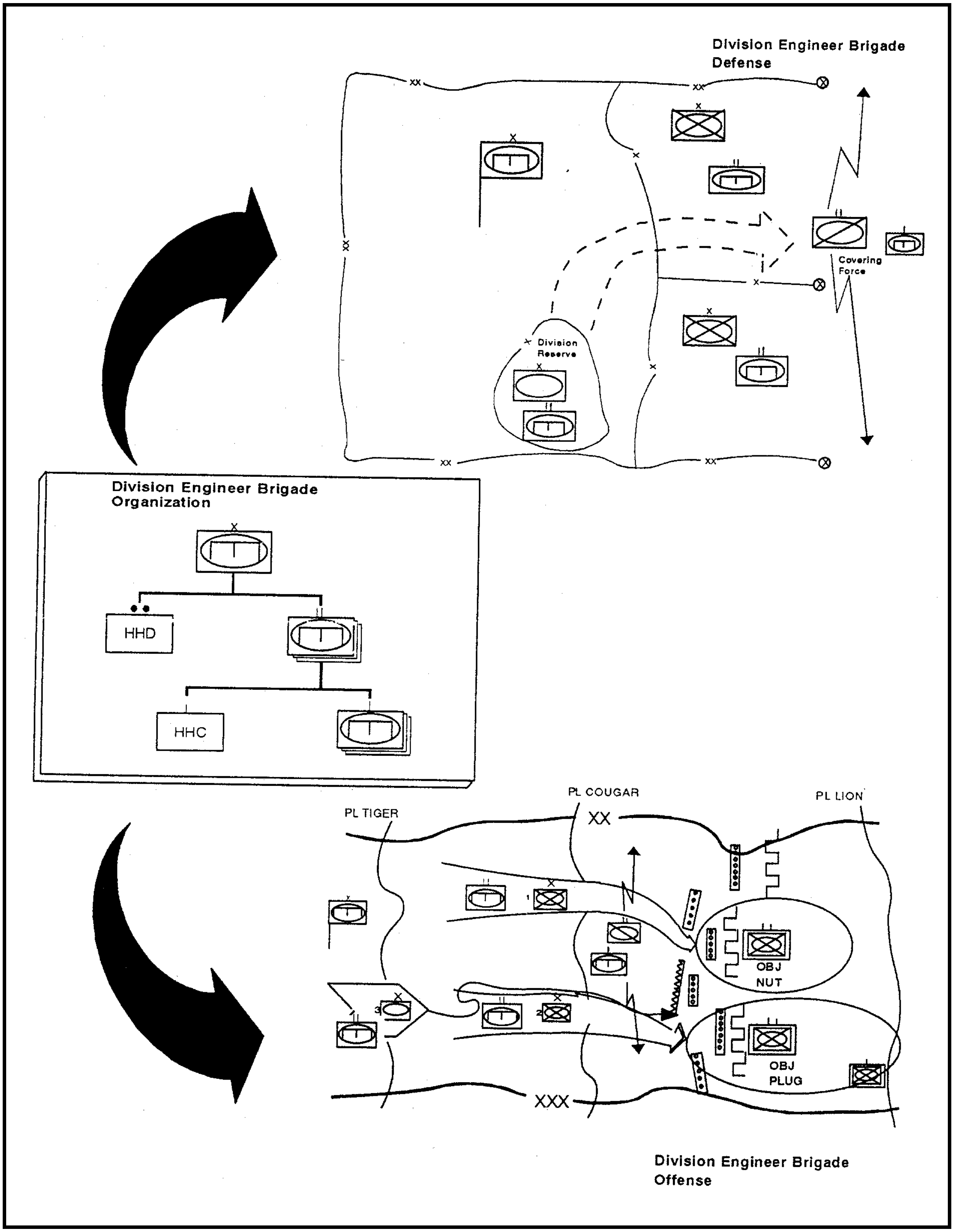

Figure 1-1. Analog divisional engineer laydown

Light Infantry Division

Due to its ability to deploy, the light infantry division provides flexibility to rapidly accomplish missions on a global basis. It has the ability to operate in terrain or against a threat unsuitable for armored forces. The division conducts operations by exploiting the advantages of restricted terrain and limited visibility. In mid- to high-intensity conflicts, the light division can be augmented with armored forces. Based on the situational factors of mission, enemy, terrain, troops, time available, and civilian considerations (METT-TC), a light infantry brigade (with the appropriate CSS augmentation) can be task organized to an armored division.The division is designed to conduct autonomous operations for up to 48 hours. The light infantry division typically has three ground-maneuver brigades (three light infantry battalions) and an aviation brigade.

The light infantry division has an organic light engineer battalion. The division light engineer battalion focuses on supporting the division's fight by task organizing elements of his assault and obstacle (A&O) platoon, combat engineer companies, and corps assets. The task organization of division light engineers depends on METT-TC and requires much more flexibility. Division light engineers must be concentrated at the critical place and time under centralized control. For example, two division engineer companies could be massed to one maneuver brigade or one division engineer company massed to an infantry battalion if METT-TC dictates this level of support. Austere division light engineer companies require augmentation for extended operations. Figure 1-2, page 1-4, shows engineers organic to the light infantry division and generic engineer task organization for division defensive and offensive operations.

Airborne Division

The airborne division can rapidly deploy anywhere in the world. It conducts airborne assaults in the enemy's rear to secure terrain, interdict routes of resupply, or interdict enemy withdrawal routes. It is ideally suited to seize, secure, and repair airfields and to provide a forward operating base for follow-on forces. The airborne division may be the initial force for contingency operations, and it secures the necessary lodgment for force buildup. The division consists of three ground-maneuver brigades (each with three airborne infantry battalions) and an aviation brigade.

The airborne division has one organic division airborne engineer battalion. The division engineer focuses on

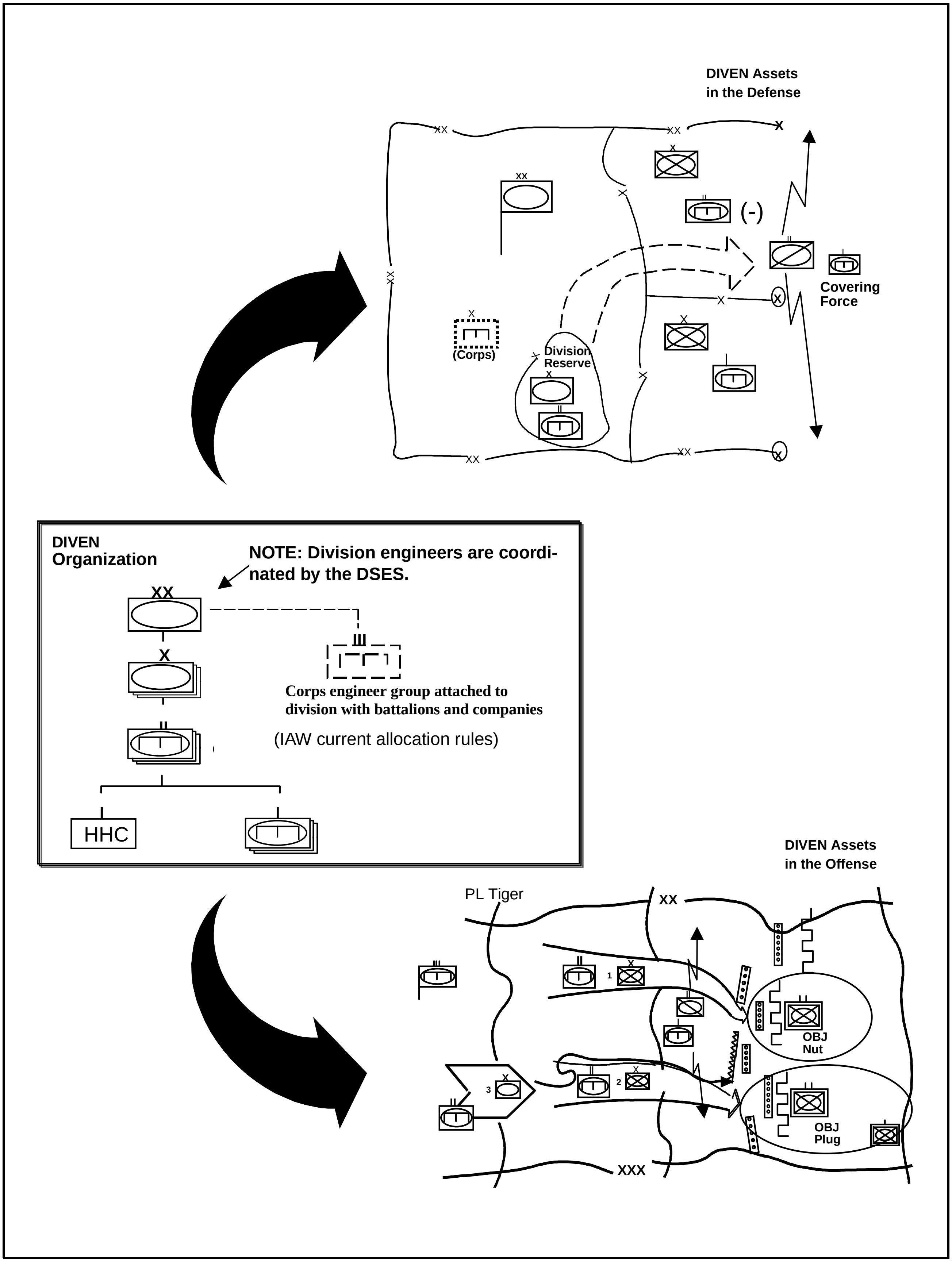

Figure 1-1a. FXXI DIVEN, heavy division

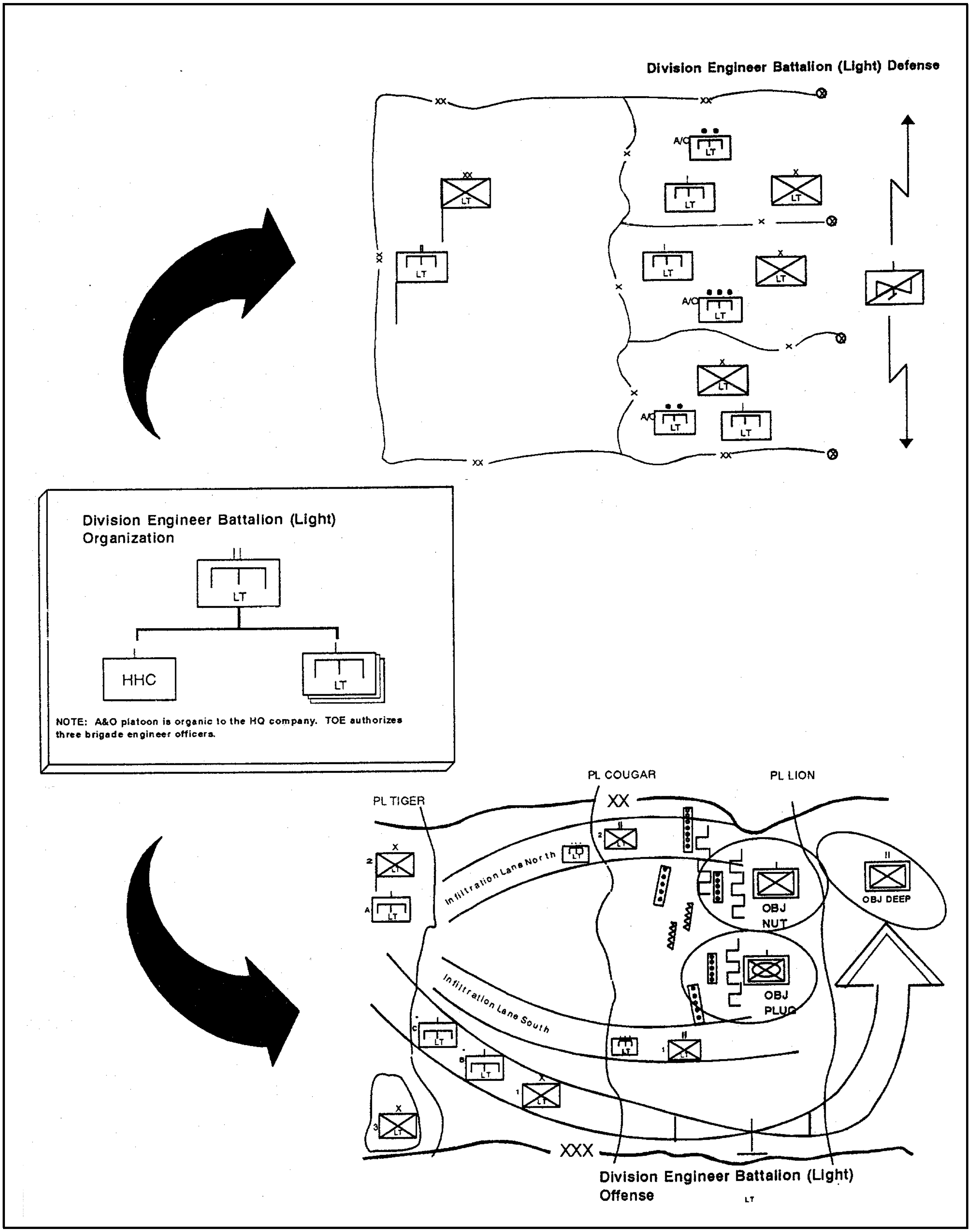

Figure 1-2. Division engineer battalion (light) laydown

supporting the division's fight by task organizing the A&O platoon, combat engineer companies, and corps assets. The task organization of division airborne engineers depends on METT-TC and requires flexibility. Division airborne engineer battalions are austere organizations. Organic assets, such as small emplacement excavators (SEEs), Volcanos, and engineer squad vehicles, allow the airborne division engineer battalion to conduct short-term operations. For extended operations, the division airborne engineer battalion normally requires corps augmentation. Figure 1-3, page 1-6, shows engineers organic to the airborne infantry division and the generic engineer task organization for a division offensive and securing an airhead.

Air Assault Division

The air assault division combines strategic mobility with an extremely high degree of tactical mobility within its area of operations (AO). Once on the ground, the air assault division fights like an airborne or infantry division; however, their air mobility permits rapid aerial deployment and redeployment. The air assault division has more ground and aerial antiarmor assets than other light infantry divisions. The air assault division consists of three ground-maneuver brigades (having three air assault infantry battalions each) and an aviation brigade.

The air assault division has one division air assault engineer battalion. The division air assault engineer organization is similar to the division airborne engineer organization. However, the division air assault engineer battalion has enhanced tactical mobility due to the air mobility assets organic to the division. It also has additional haul assets organic to the engineer company. Figure 1-4, page 1-7, shows engineers organic to the air assault infantry division and the generic engineer task organization for division offensive and hasty defensive operations after a deep strike.

CORPS ENGINEER SUPPORT

Echelon above division (EAD) engineer forces augment division IAW current allocation rules, focusing on decisive mobility, countermobility, and survivability support to maneuver forces. Corps engineers also provide needed additional support in sustainment and topographic engineering.

In an analog division, engineers satisfy the most immediate engineer requirements for the division's decisive operations. Corps-level augmentation (EAD engineer forces) is required for engineer mobility missions such as bridging and large-scale breaching operations, intense countermobility and survivability missions associated with deliberate defenses, and significant rear missions such as sustainment engineering support for aviation units and support areas.

A FXXI division is a capability-based force whose lethality, survivability, and maneuverability is increased with FXXI digital enablers. Enhanced situational awareness capabilities and reductions in manning and equipment quantities of the heavy division engineer battalions has less to even more reliance on EAD engineer forces. The division engineer effectively integrates EAD engineer forces, which provides increased flexibility for rapid task organization changes to weight the effort and complements divisional engineers' capabilities.

For security and to avoid fratricide, EAD engineer forces not equipped with FXXI FBCB2 assets when working with digitally equipped units, must establish standard procedures that help others to recognize their location. These procedures are required to alert all elements that friendly vehicles and troops are operating in the area.

Corps Engineer Brigade. The corps combat engineer brigade is a large, flexible organization structured to provide engineer C2 at corps level, beginning with a contingency and going through a force projection to a fully developed corps AO. It contains all of the specialized engineer units, engineer battalions, and engineer group headquarters required to support corps-level operations. When supporting a division, the corps engineer and his corps staff engineer section (SES) integrate with the division engineer to synchronize the work effort. The division engineer provides recommendations to the division commander related to the employment of corps engineer forces, coordinating with the corps SES. The mix and type of units assigned to the corps engineer brigade is determined by the number and types of divisions that make up the corps and by METT-TC. In many cases, engineer units from echelons above corps (EAC) will be task organized to the corps engineer brigade. See Figure 1-5, page 1-8, for a sample corps engineer brigade assigned to a corps consisting of one light infantry division, three armored divisions, and an armored CAV regiment.

NOTE: The SES will use MCS as their primary means of communications. Digital input from other digital systems collocated at the corps main are used to track and coordinate all current divisional engineer situational reports and terrain information. Other digital systems used by the SES include the battlefield video teleconferencing (BVTC), All-Source Analysis System (ASAS), Warfighter Associate (WFA) downlinks, DTSS, and Combat Service Support Control System (CSSCS).

Combat *Engineer Group*. An engineer group is a flexible C2 headquarters with

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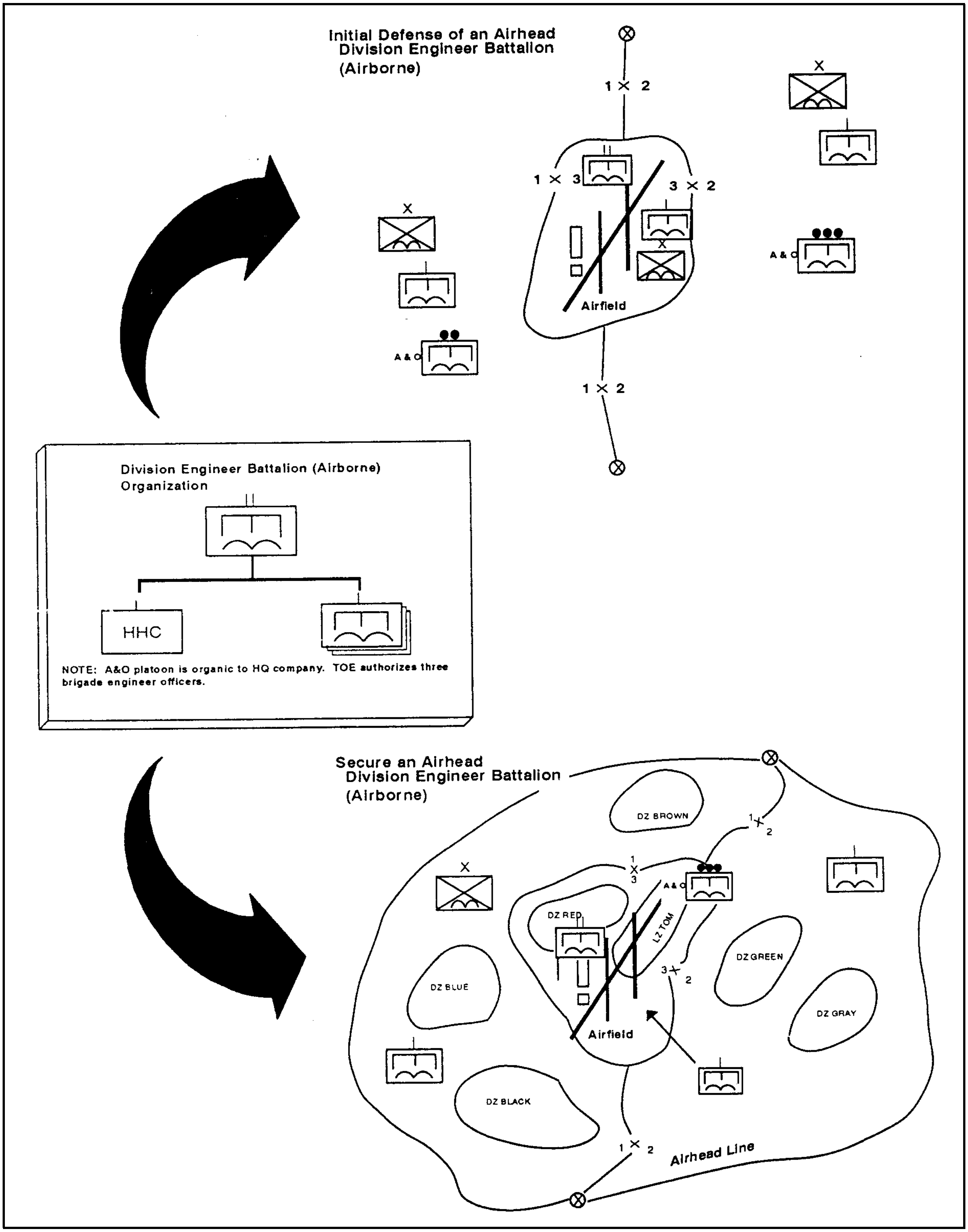

Figure 1-3. Division engineer battalion (airborne) laydown

engineer battalions and companies assigned to it based on the analysis of METT-TC.

Engineer groups are primarily designed to support divisions. In such a role, the group may become the engineer headquarters for a light division when the division receives significant augmentation from the corps engineer brigade. The group may also become the engineer headquarters for a special-purpose mission, such as a river-crossing operation, for either light or armored divisions. When not required for a front-line mission, the group normally assumes responsibilities in the corps or division rear, where it directs engineer missions supporting corps units such as the corps aviation brigade, corps artillery, and corps support command.

With the loss of the divisional engineer brigade in a FXXI division, EAD engineer forces will have a heavier requirement to provide command and control, planning, and integration capabilities at the division level. For example, based on the FXXI equipment capabilities of this engineer group, its commander could assume key operations conducted between the division's maneuver-brigade areas and sustainment operations at both the division and brigade support areas.

Corps may provide a digital LNO team for interaction with their analog units and the FXXI divisional engineers to facilitate coordination and support. In lieu of Corps providing these assets, the Divisional Engineer recommends liaison activities based on METT-TC.

NOTE: The corps engineer group has limited Army Tactical Command and Control System (ATCCS) capability. If elements of this group augment the division, corps engineer planners must develop TTP that ensure these brigade assets, when deployed, are properly equipped to maintain digital SA and effect digital information exchanges.

When the combat engineer group enters the division sector, it comes under the control of the division. The division engineer advises the division commander on the best way to use the group. This pertains to both light and armored forces. In special cases, the division commander may transfer DIVEN organizational responsibilities to a combat engineer group that has been task organized to the division on a long-term basis. Normally, this is only done when corps engineer augmentation surpasses the C2 capability of the DIVEN battalion headquarters.

A combat engineer group is used most frequently within a division to act as a headquarters for all corps combat engineers, bridge companies, combat support equipment (CSE) and light equipment companies (LECs), and EAC units such as combat-heavy battalions that have been task organized to a division on a mission basis.

A FXXI division, may be required to provide a C2 headquarters. This headquarters would exercise C2 over all engineer units working with the DSES. For example, based on the FXXI equipment capabilities of the engineer group, the group commander could assume command of key engineer operations that are conducted between the division's maneuver-brigade areas.

Typical corps engineer organization support and laydown for armored and light divisions are depicted in Figure 1-5 and Figure 1-6, page 1-10. It should be noted that IAW current allocation rules, the assignment of a group headquarters is based on the number of corps battalions allocated to a division. In a corps fight, not every division is allocated a group headquarters.

Operations with Analog Units. Liaison is normally lower to higher, right to left. Until the first corps is digitized, the digitized division may find itself supporting liaison activities that corps would normally support. There are a number of techniques to consider that will assist in coordination with these units. Liaison parties will almost always be necessary to ensure full exchange of informa-

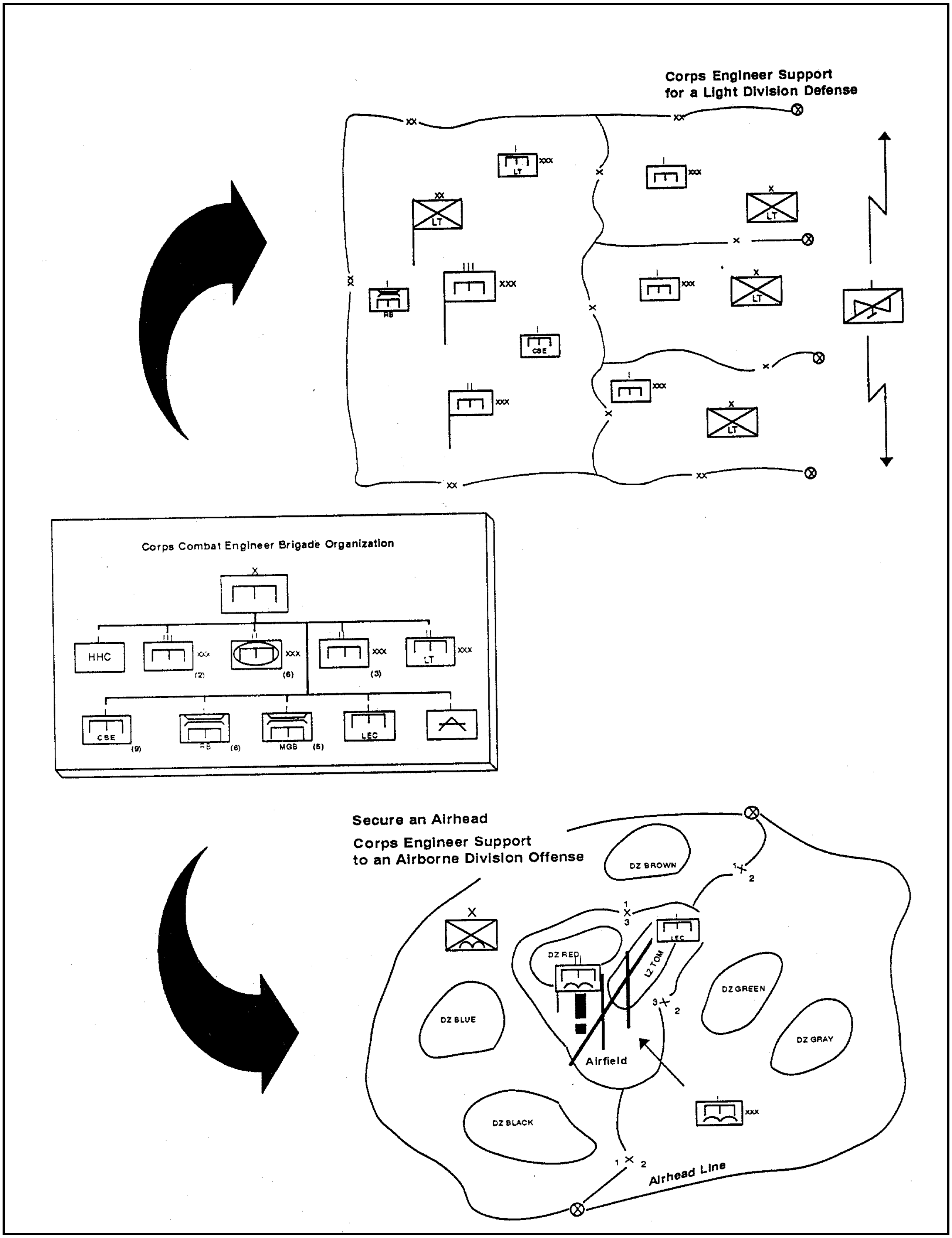

Figure 1-6. Corps support to light forces operations

tion between digitized and non-digitized elements of the force.

It is essential for a digitized unit to exchange liaison teams with nondigitized units early and consistently throughout the planning process. Nondigitized units will conduct parallel planning and have a disadvantage without the digital staff tools. Parallel planning requires rapid exchange of information with analog units during the planning process. Involving higher, adjacent, and lower staff elements early in the planning process allows the entire staff to "see" both current and future operations and help identify known or potential problem areas.

Liaison teams may be sent to the analog unit's CP for coordination. The human component of situational understanding/warning orders and informal information exchange is an important part of the COP. The number of liaison officer (LNO) teams in a FXXI division is limited, and this will not solve the problem of positioning analog units without situational understanding. LNO teams may be used to escort elements of the analog unit, possibly down to single vehicles if necessary. This option provides situational understanding of these elements but is only practical if the unit forms additional LNO elements.

The equipment and skills required of the liaison teams are a function of the type of operation being conducted and the force the team is coordinating with. For a digitized unit, there are three basic considerations when task organizing liaison teams:

- ***Digitized force to digitized force liaison teams.*** These require the least equipment and personnel because information is easily shared in near-real time. Critical situational understanding is maintained in each unit's knowledge base.
- ***Digitized force to nondigitized force liaison teams.*** These are required when conducting operations with some AC units, most RC units, and coalition forces. These teams require a full suite of digital systems to maintain the parent unit's common operational picture and to provide situational understanding of the nondigitized force back to their headquarters. This situation may require representatives from each staff section.
- ***Digitized force to nonmilitary forces or agencies.*** This situation requires the teams discussed above, augmented with additional special equipment and possibly personnel.

CLOSE, DEEP, AND REAR OPERATIONS

Since the location of engineer functions on the battlefield dictates different planning requirements, coordination, and execution techniques, division engineer leaders must understand the relationship between engineer functions and close, deep, and rear operations (Figure 1-7, page 1-11).

NOTE: The three basic divisional operation centers that focus engineer actions and activities during close, deep, and rear operations are the division tactical command post (DTAC) MOB cell, DMAIN MOB cell, and the security and sustainment operations cell (SSOC). In the FXXI division, there is no rear command post (CP).

Close Operations

A division's close operations include the simultaneous close, deep, and rear operations of its subordinate brigades and battalions. The outcome of the division's close operations will ultimately determine the success or failure of the division battle. Deep and rear operations are focused primarily on creating conditions favorable for winning the close operation.

Close operations are usually the main effort for division engineer planning and execution.

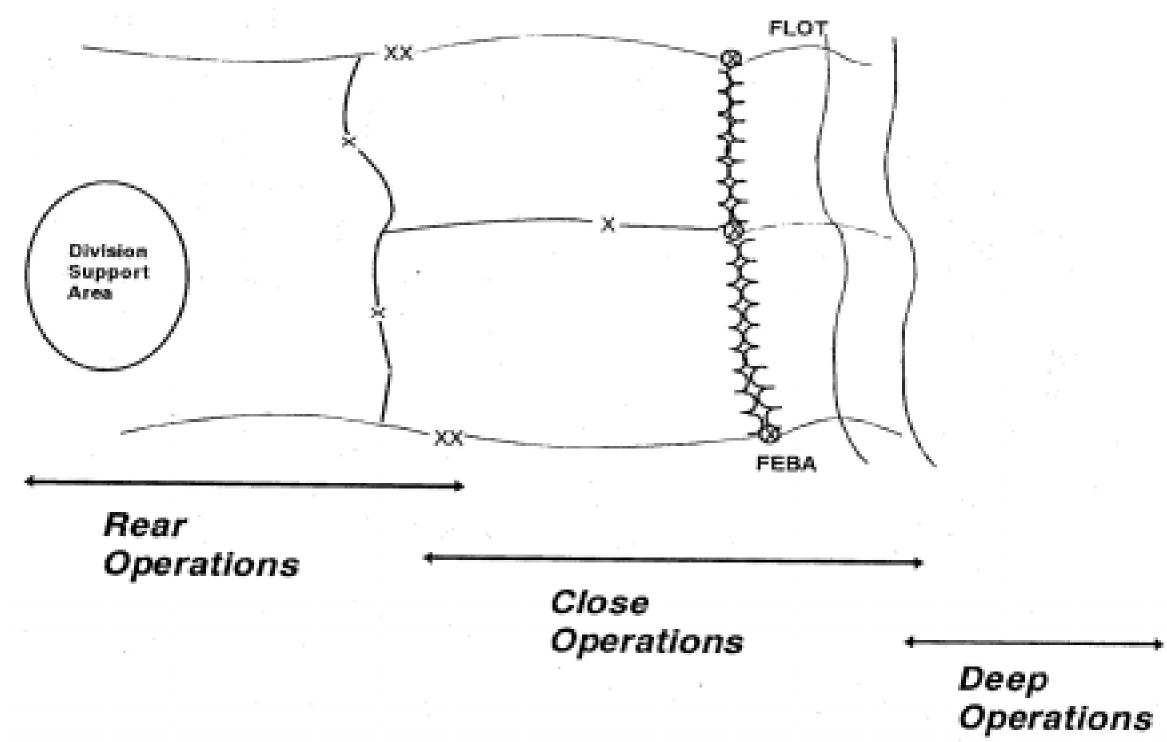

Figure 1-7. Battlefield framework

The elements of combat power (maneuver, firepower, protection, and leadership) are critical for success in close operations. They are also essential to understanding the dual roles of the DIVEN commander as a division staff officer and the DIVEN organization commander.

Like the analog DIVEN, close operations continue to dominate the main effort in planning and synchronization for a FXXI division. However, digital enablers allow FXXI engineers to look further in space and time, analyzing second- and third-degree effects, thus adapting a more anticipated warfare environment to support the maneuver commander's intent and scheme of maneuver.

The division engineer in either an analog or a FXXI division plans, coordinates, and synchronizes mobility and countermobility operations to ensure the division's freedom to maneuver. Mobility and countermobility operations also increase and protect division firepower. This preserves the division's freedom of action, reduces friendly force vulnerability, and helps gain the advantage of position. The division engineer also plans, coordinates, and synchronizes survivability operations to support the protection of division forces. This ensures that division forces have adequate fighting positions and camouflage, can reposition and resupply, and can conduct deception operations as necessary. Finally, the division engineer enhances division leadership by being technically and tactically competent. This enables him to provide purpose, direction, and motivation for the engineer forces operating for the division during combat.

Division engineer units perform a significant role in enhancing the elements of combat power at the tactical level. Division engineers enhance maneuver by reducing obstacles in a combined arms breach to preserve freedom of movement and by placing obstacles to gain the advantage of position. They affect firepower by properly integrating obstacles with direct- and indirect-fire systems and fire-control measures. Division engineer units protect division forces by providing technical expertise and labor, augmented by the supported force, to construct survivable firing positions for weapon systems, fortifications, protective obstacles, and strongpoints. All missions carried out by division engineer units increase the division's war-fighting capability. This gives individual soldiers confidence in the division plan and, ultimately, confidence in their leaders.

Digital enablers in the FXXI environment provide engineers at all echelons with near-real-time situational awareness. Geospatial (aeronautical, hydrographic, geodetic, and topographic) information on the nature and characteristics of the AO provides a common representation of the physical characteristics of the battlespace. The ability to visualize the battlespace and understand the current situational environment is a key intangible attribute FXXI engineers bring to the planning table.

As planning continues, the division engineer staff continues to upgrade terrain and obstacle data and provides digital overlays via MCS. These overlays reflect enemy and friendly obstacle data as well as the location and direction of enemy forces' movement. The DMAIN or tactical operations center (TAC) MOB cell may trigger pre-positioned Raptor ICO sensors to provide early warning related to enemy movement. Additional information on enemy minefield and obstacle locations is provided to the DTAC by special operations forces (SOF), scouts of the maneuver battalions or brigade reconnaissance troop (BRT), air cavalry scouts, or engineer reconnaissance teams. Spot, situation, and obstacle reports are provided using FBCB2; while precision information related to bridges, mines, or obstacles is relayed via reconnaissance assets.

Deep Operations

The division engineer's effort in deep operations focuses on disrupting the timing of committed threat forces, shaping future close operations, and preventing or hindering enemy uncommitted forces or resources from influencing the close operation. The division engineer plans for deep operations by supplementing the commander's intelligence preparation of the battlefield (IPB) process and by the employment of engineer assets. Supplementing the IPB involves extensive terrain analysis (topographic engineering) and high-value target (HVT) analysis or nominations. The employment of engineer assets focuses on situational obstacle planning and on using scatterable mines against HVTs or along critical choke points. If deep operations include the use of ground forces (such as a raid or securing an airfield), engineer forces must be integrated where required. In support of this deep operation, division engineers conduct breaching, assault bridging, lane marking, forward aviation combat engineering support, and countermobility support for a hasty defense.

NOTE: Deep operations in the FXXI division are characterized by extensive terrain analysis that can be quickly performed using automated terrain analysis tools found in the DTSS, ASAS-RWS, and MCS.

Rear Operations

Division engineers support the division commander's intent for rear operations by ensuring the freedom of maneuver and the continuity of operations through sustainment. They rely heavily on additional corps engineer support. The division engineer integrates and synchronizes mobility and sustainment engineering operations for lines of communication (LOC) construction and maintenance, survivability of critical C2 nodes or assets, and countermobility for base cluster defenses.

Division engineers upgrade main supply routes (MSRs) and other routes for movement of sustainment and C2 traffic and for repositioning the division's reserves and fire support. Numerous other sustainment activities (such as facilities maintenance and construction for CSS and aviation) require engineer support in case of rear area damage. Engineers assist the supported unit in constructing fortifications, protective obstacles, and hasty fighting positions for critical C2 nodes, CS or CSS organizations, and base cluster defenses.

NOTE: In the absence of a rear area in the FXXI division, rear area functions are controlled by the assistant division commander for support (ADC-S) from the SSOC. The SSOC is collocated with the DMAIN sustainment cell. Digital systems and corps augmentations will enhance the division engineer's ability to coordinate and manage support as directed by the ADC-S.

Engineers support the division by providing assets to enhance force protection. Force protection involves those protective measures (predetonation fences; cover-from-view screens; sacrificial areas, walls, and roofs; blast zones; barricades; and building evaluations) taken against low-level threats or typical terrorist acts. For countermobility operations, engineers not only advise units but also construct obstacles in support of base cluster defenses. With the advent of the Raptor ICO (when fielded), division engineer organizations will have the capability to employ this munition in multiple missions and roles to facilitate force protection.

DIVISION ENGINEER ROLE IN THE BATTLEFIELD OPERATING SYSTEM

The division engineer must understand the battlefield operating systems (BOSs) and his role in support of each system. It is this role that drives the interaction between the division engineer and other combined arms staffs and helps to identify engineer missions supporting all facets of the division plan. A complete understanding of the BOS is essential for synchronization of engineer operations and unity of effort.

This understanding drives effective coordination and staff interaction necessary to enable planning, wargaming, course-of-action analysis/development, and tactical decision making. In turn, the division engineer and his staff must be capable of sharing digital information with other BOS elements. This ensures that engineer plans and operations are consistently integrated and synchronized with those of other staff planners.

Intelligence

Division intelligence assets provide the capability to locate and attack the threat in support of close, deep, and rear operations. The FXXI division's analysis and control element (ACE) located at the DMAIN and the ACE forward located at the DTAC will primarily use the All-Source Analysis System (ASAS), Block II, ASAS-RWS, and MCS to perform continuous IPB, data collection/management functions, coordinate/share information, effect planning/decision making, and accomplish C2. Intelligence-gathering activities will be performed by a number of airborne, space-borne, and ground sensors. The IPB is the major product resulting from the planning process that links the intelligence BOS with other operating systems. The IPB orients all planning and execution for the division. During the initial stages of IPB, the FXXI division's topographic terrain team will conduct a terrain and weather analysis and assess the impact on mobility, countermobility, and survivability efforts of both enemy and friendly forces. This is accomplished by using DTSS information digitally drawn from multiple national, strategic, or tactical sources. The division engineer uses the engineer battlefield assessment (EBA) to provide input to the IPB. He focuses on terrain analysis and the threat's mobility, countermobility, and survivability capabilities. The division's terrain detachment plays a key role in assisting the IPB and developing terrain products for the EBA and IPB processes. The division engineer nominates named areas of interest (NAIs) and priority intelligence requirements (PIR) to the G2 to confirm or deny critical engineer characteristics of the enemy situation and terrain. Therefore, the division engineer will identify NAIs within the division AO and coordinate his intelligence-gathering requirements with the G2. The FXXI division G2's UAV assets, are capable of aiding the engineer intelligence collection effort. Finding enemy obstacles or seeing enemy obstacle activity validates the estimate of the enemy intentions and plans as well as the strength of his forces.

Engineer forces can act as intelligence collection assets for technical or tactical reconnaissance. Technical reconnaissance missions focus on collecting information about a target, an area, or a route. This type of reconnaissance gathers information about the target and possible emplacing forces. It is usually conducted under a low-level threat and in areas physically controlled by friendly forces. Engineer forces can anticipate the following technical reconnaissance missions: river crossing, engineer resource, bridge, route and road, forward landing strip, tunnel, ford and ferry crossing, water resource, and environmental.

Division engineers supplement the combined arms reconnaissance effort through tactical reconnaissance. Tactical reconnaissance is conducted against a target in areas where enemy contact is likely and the reconnaissance mission is an integral part of confirming or denying the IPB. Division engineers can anticipate the following tactical reconnaissance missions: enemy obstacle, enemy engineer activity, river, landing zone (LZ) or pickup zone (PZ), terrain specific, situational obstacle locations, reserve or directed obstacles (bridge demolitions and road craters), and military operations on urbanized terrain (MOUT) (building evaluations and utility facility reconnoiters). For tactical reconnaissance, division engineers are task organized to maneuver reconnaissance elements.

FXXI engineer reconnaissance elements will be equipped with FBCB2. They will also be equipped with Land Warrior and Raptor ICO when these systems are fielded. The FBCB2 is the primary system used to transmit digital spot reports and provide other details related to reconnaissance findings. Raptor ICO sensors employed at key locations by engineer reconnaissance personnel can provide a timely and accurate picture of enemy movements when activated.

The FXXI division engineer, in concert with the G2, participates in the IPB process and the development of a relevant common picture (RCP) of the division battle space. The division engineer's focus on IPB development extends to terrain visualization, and locating and tracking enemy engineer assets and activities, to include both mobility equipment and obstacle locations.

The DMAIN MOB cell digitally shares terrain and enemy obstacle information through the MCS-ENG to the G2 MCS. The G2 will integrate this information into the ACE threat database. This information can be "pulled" from ASAS-RWS and MCS databases or home pages via the Army Battle Command System (ABCS) client-server relationships. This allows terrain and enemy-obstacle information to be digitally shared with all other staff users and subordinate elements of the division using the file transfer protocol (FTP) function. The MOB cells in the DTAC and DMAIN provide a division-wide update of terrain and enemy obstacle information as they receive digital, voice, and sensor reports from subordinate engineer units and systems that support the maneuver brigades.

Maneuver

Maneuver at division level places or moves battalion- and brigade-size combat forces into positions where they can bring direct and indirect fires to bear on the enemy with the greatest effectiveness. The relationship of engineer functions and maneuver differs significantly in the offense and the defense. However, a common thread in the two missions is enhancing the division's ability to concentrate combat power.

In the offense, the division engineer combined arms focuses on mobility with river/gap-crossing and breaching operations. This enables the division to go where it wants and concentrate combat power against a threat weakness or create a weakness. The engineer's planning and integration impact on the total scheme of maneuver. For example, the force allocation ratios for the breach organization (support, breach, and assault forces) and the synchronization of the breaching fundamentals (suppress, obscure, secure, and reduce [SOSR]) have a direct impact on the task organization and subordinate breaching tasks. The division engineer also plans for countermobility support to protect the flanks with situational obstacles and for the transition to a hasty defense.

In the defense, the division engineer focuses on mobility, countermobility, and survivability operations. This allows the division to fight from survivable positions against the threat's fires and to use obstacles to attack the threat's ability to maneuver. The combination of the two allows the division to mass fires to complete the threat destruction. The division engineer plans obstacle zones that are tied directly to the division's maneuver scheme. The division commander's intent provides focus to the countermobility effort. It also provides the necessary obstacle control for tactical repositioning.

Engineer forces breach enemy obstacles, clear routes, construct tactical and protective obstacles, build fortifications, and construct fighting positions. All activities are directly related to and supportive of the decisive commitment of combat power.

The maneuver brigade and battalions will be equipped with the family of ABCS (such as ASAS-RWS; MCS; Advanced Field Artillery Tactical Data System [AFATDS]; forward area air defense command, control, and intelligence [FAADC2I]; air-missile defense work/station [AMDW/S], and Combat Service Support Control System [CSSCS]) to perform different data collection/management functions, coordinate/share information, effect planning/decision making, and accomplish C2. Maneuver brigades and battalions of the FXXI division can accomplish precision maneuver through the use of FBCB2 and the Enhanced Position Location Reporting System (EPLRS)/precision lightweight ground position receiver (PLGR). The conduct of precision maneuver places or moves battalion- and brigade-sized combat elements into positions where they can bring direct and indirect fires to bear on the enemy with the greatest effect. The relationship of engineer functions and maneuver differs significantly in the offense and the defense. However, a common thread appearing in the two missions is the maintenance of the division's mobility and freedom to maneuver. (See FM 100-5 and Chapters 3 and 4, FM 71-100, for more information.)

Mobility and Survivability

Mobility and survivability (M/S) operations provide mobility to division units; degrade the enemy's ability to move on the battlefield; and provide protection to division personnel, equipment, and supplies.

The division engineer synchronizes M/S functions in the massing of effects in support of the maneuver commanders intent and scheme of maneuver. M/S operations are integrated into the military decision-making process (MDMP) and repetitively updated as the situation develops. Mobility operations preserve the freedom of maneuver of friendly forces. Coordination and synchronization of engineer assets (divisional and nondivisional) support the freedom of movement for personnel and equipment within an AO without delays due to terrain, barriers, obstacles, and mines. Recommendations and estimates from the division engineer to the maneuver commander support movement of combat forces in achieving a position of advantage with respect to enemy forces. This includes the employment of engineer assets on the battlefield for mobility and countermobility operations.

Obstacles are any characteristics of the terrain that impede the mobility of the force. The division engineer uses these obstacles to support the Division Commander's scheme of maneuver. When integrated with maneuver and fires, obstacles can create a decisive battlefield effect. Countermobility operations include the planning and integration of reinforcing obstacles with fires to attack the maneuver of an enemy force, increase time for target acquisition, and increase weapon effectiveness. To achieve this purpose, obstacle planning is integrated during MDMP, and target planning and processing. This task includes maintaining integration through obstacle turnover, protection, and tracking. Obstacle plans must mature as the division commander's plans mature. The division engineer maintains obstacle integration into the scheme of maneuver through the duration of the mission. Obstacle tracking includes supervising the achievement of key milestones as part of the unit's timeline (Class IV/V forward, initiate engagement area development, siting complete), collation and dissemination of obstacle information, and maintenance of records.

Survivability is the protection of the tactical force's fighting potential so that it can be applied at the appropriate time and place. The division engineer's survivability estimates include the use of protective positions (natural or artificial), measures, or equipment (such as armor, detection, and protective equipment) to reduce the effects of enemy weapon systems. This function also includes estimating construction of fighting and survivability positions, estimating decoy operations, and responding to enemy fires and maneuver operations. Decoy operations include the synchronization of engineer forces to protect friendly forces, personnel, materiel, equipment, and information system nodes from observation and surveillance through the use of natural or artificial material.

The M/S BOS requires the combined efforts of all combat, CS, and CSS forces. Missions in this BOS are not the total responsibility of the engineer force. Conducting a breach operation is an example of a mobility mission requiring a total combined arms effort. Engineer involvement is only one aspect of the operation (reduction of lanes through the obstacle). The bulk of support requires the synchronized effort of all arms to suppress, obscure, and secure the obstacle. Emplacing fighting positions is an example of a survivability mission. While engineers provide the equipment and soldiers to construct the positions, the type and level of survivability is largely based on the Intelligence Officer's (US Army) (S2's) analysis of the threat and the maneuver commander's priorities. Furthermore, while the engineer digs the position, the location and orientation of each position are based on the direction of the maneuver commander.

The division engineer has two roles in the M/S BOS. The first is to advise the division headquarters on M/S operations. The second is to assess and assign engineer missions in support of this BOS, as well as all other BOSs. Figure 1-8, page 1-18, illustrates some of the engineer tasks that support the M/S operating system. Chapters 3, 4, and 5 discuss both the division engineer's functions and engineer unit missions in support of the M/S BOS for offensive, defensive, and other tactical operations.

The accomplishment of operations will be enhanced with the introduction of new engineer mobility systems into FXXI unit engineer inventories such as the Grizzly, Wolverine, ACE, and engineer squad vehicle. In addition, the ability to gain information relative to enemy locations and direction of movement will be enhanced through Raptor ICOs (when fielded). DTSS provides highly accurate details related to terrain and its

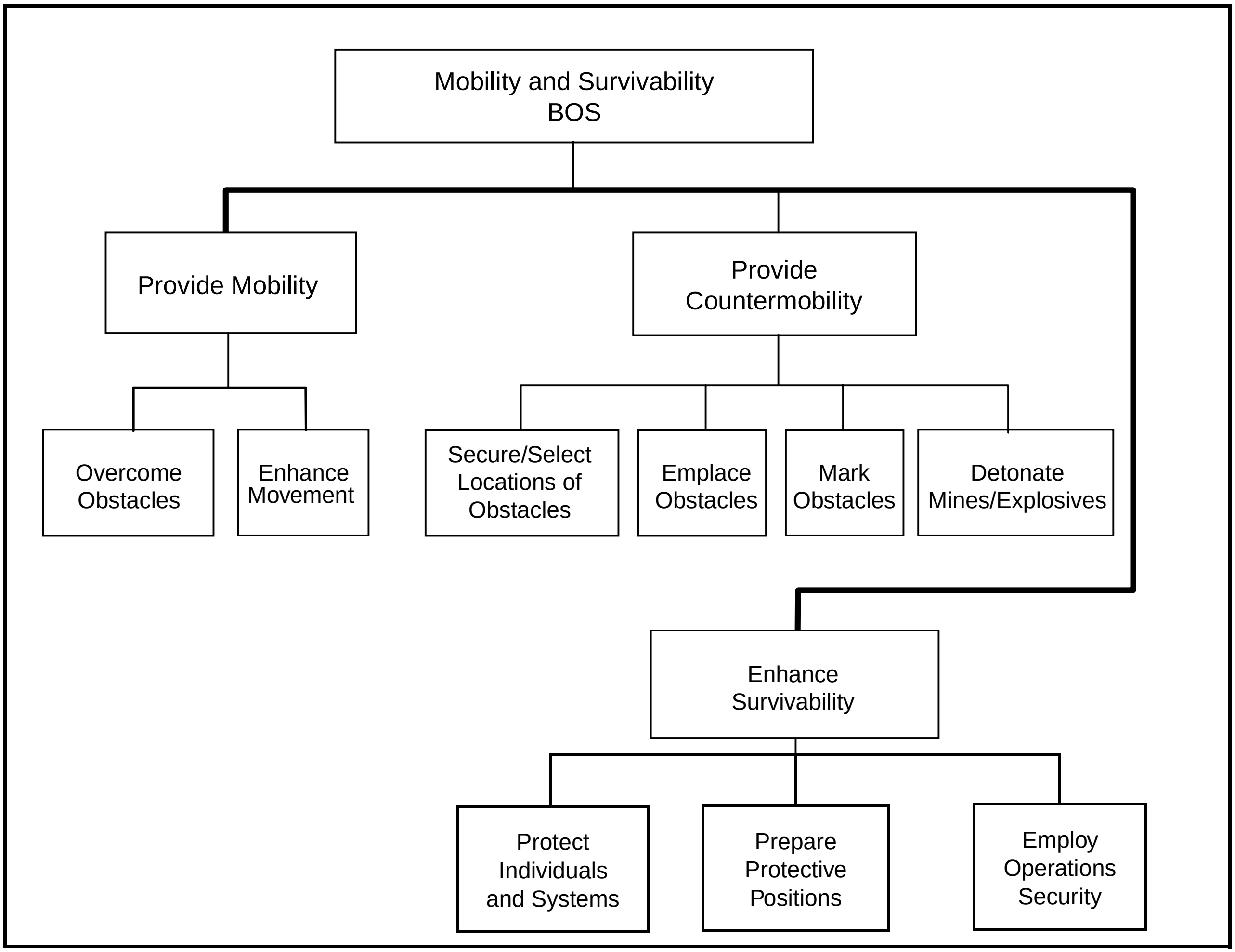

Figure 1-8. M/S battlefield operating system

impacts on mobility and countermobility operations.

Fire Support

Fire support integrates the full range of fire-support systems to support the division's maneuver scheme and to preserve freedom of maneuver by fighting deep, close, and rear operations. Overwhelming counterfire is also a critical element of fire support. The challenge to the division engineer is the timely and effective integration of the engineer battlefield functions. Offensive and defensive operations have different fire-support integration concerns with engineer missions.

In the offense, the division engineer focuses integration efforts with fire support in three areas: suppression, obscuration, and counterfires. For breaching operations, suppression is the massing of all available fires on threat personnel, weapons, or equipment. The division engineer coordinates indirect fires to isolate the breaching site and to protect the breach force. He ensures that well-synchronized fire-control measures are planned for timely massing, lifting, and shifting. Obscuration hampers the threat's observation and target acquisition and conceals friendly activities and movement. The division engineer coordinates screening or deception smoke to protect the obstacle reduction effort and the passage of assault forces. Counterfires are crucial in protecting the force as it closes in on the enemy and makes the initial penetration. The division engineer coordinates fire-support counterfires with breaching and river-crossing operations during critical periods of vulnerability. This protects the combat power of support, breach, and assault forces.

In the defense, the division engineer focuses on integrating obstacle effects and indirect fires. For each obstacle effect, specific integration techniques of indirect fires are required. For example, to achieve a disrupt obstacle effect, the engineer coordinates indirect fires to cover the obstacles while direct fires target the bypass. In contrast, to achieve a turn effect, artillery groups are massed at the point at which the turn is to be initiated and then throughout the rest of the obstacle effect. The division engineer ensures the scheme of fires and obstacles are mutually supportive.

The division engineer also coordinates with the fire-support representative regarding the use of indirect-fire assets to deliver scatterable mines and situational obstacles. While the field artillery delivers some types of scatterable mines, the engineer is the principal advisor to the maneuver commander for the tactical employment of all scatterable mines, regardless of the means of delivery. The engineer, in conjunction with the operations and fire-support officers, plans and coordinates the employment of scatterable mines and the fires that cover them. Field artillery scatterable mines may be used to employ situational obstacles. Again, the engineer plans and coordinates the employment of situational obstacles in conjunction with the operations and fire-support officers.

Engineer forces and fire-support assets reciprocate in the support they give and receive. Engineers provide mobility support for freedom of movement for personnel and equipment and survivability support in the construction of vehicle fighting positions for protection of combat vehicles, radars, combat systems, and key information systems. In turn, divisional artillery assets supporting a combined arms breach in the offense provide planned fires for suppression and obscuration of the enemy, and establish critical friendly zones (CFZ) at breach sites to support counterfire operations. For light forces, construction of artillery survivability firing positions becomes a high priority due to a lack in their artillery mobility.

The division engineer synchronizes engineer forces in constructing or repairing combat roads and trails, forward airfields, and landing zones to facilitate the movement of personnel, equipment, and supplies. The enhancement of movement and maneuver in the division's forward AO includes planning and coordinating the maintenance of travel routes for equipment and personnel, delineating routes of travel, performing reconnaissance, clearing ground cover, performing earthwork, providing drainage, stabilizing soil, preparing the road surface for transit by Army combat and tactical vehicles, and constructing and maintaining forward airfields and landing zones.

FXXI division fire-support systems consist of lethal (artillery, tactical close air support [CAS], Army attack helicopters, mortars) and nonlethal electronic warfare (EW) fires. The DMAIN targeting and fires cell and the FSE of the DTAC will primarily use Advanced Field Artillery Tactical Data System (AFATDS), ASAS-RWS, and MCS to collect and share information and to plan, coordinate, and effect C2. The division commander, with assistance provided by the division artillery (DIVARTY) commander, will integrate the full range of fire-support systems to support the division's scheme of maneuver during deep, close, and rear battles. Closely tied to the division's fire-support plan is the obstacle plan. This plan, developed by the division engineer and his staff, supports the division's freedom of maneuver while denying the enemy movement. The division engineer integrates and synchronizes engineering efforts with those of the DIVARTY through face-to-face verbal coordination. Digital coordination and the exchange of digital information occurs via linkages to the MCS or AFATDS at the fire-support cell.

Air Defense

Air defense (AD) degrades or reduces the effects of enemy air attack on friendly units, supplies, and facilities. The division engineer coordinates this protection with M/S functions. He focuses integration efforts in three distinct areas. The first area is AD protection for critical engineer assets, such as the Class IV/V (obstacle) supply point, concentrations of engineer construction equipment, and tactical bridging assets. The second area is coordinating AD protection of large formations at critical choke points, such as during breaching and river-crossing operations. The third area for coordination is AD protection for engineer forces. The division engineer must be able to interface with the AD officer on integration issues in terms of vulnerability, criticality, recuperability, and the air threat against engineer operations.

Engineer forces construct fighting positions for forward AD assets, protecting them not only against the threat's suppression of enemy air defenses (SEAD) operations but also against direct and indirect fires.

The air defense artillery (ADA) elements of the division will use FAADC2I, AMDWS, and MCS to accomplish different data-collection/management functions, coordinate/share information, effect planning/decision-making, and accomplish C2. The division engineer integrates and synchronizes engineering efforts with the division ADA. This integration and synchronization is achieved through face-to-face verbal coordination on the exchange of graphical digital data via MCS.

Combat Service Support

CSS sustains the fight. The division engineer focuses his integration efforts on three different areas of CSS operations. The first area is the sustainment of engineer battlefield functions. Battlefield requirements for close, deep, and rear operations must be anticipated and then integrated and pushed forward into the fight. The second area is the engineer mission support to the division's CSS operations. As discussed earlier in the rear operations section of the battlefield framework, division engineers play a significant role in sustaining the division. Finally, engineer unit sustainment must be integrated. This encompasses both division and corps engineer forces and is discussed in Chapter 6.

The sustainment cell of the FXXI division uses CSSCS and MCS to accomplish different data collection and management functions, coordinate and share information, effect planning and decision making, and accomplish C2. The division engineer anticipates engineer requirements and works closely with the Assistant Chief of Staff, G1 (Personnel) (G1) and the G4 staff to ensure that engineer operations are consistently sustained. The division engineer's ability to anticipate and forecast requirements are enhanced based on an ability to "pull" information from the CSSCS database relative to the status of the division's engineer units and available resources. The division engineer uses this information in the planning of engineer operations and, in concert with the G4, ensures that needed Class II, IV, and V supplies are pushed forward and positioned as close to the front as possible. (See FM 71-100, FM 100-5, FM 100-10, and Chapter 6 of this manual for detailed discussions of division CSS operations.)

Command and Control

C2 allocates, prioritizes, and synchronizes assets to employ and sustain combat power. The division engineer must integrate C2 of all engineer battlefield functions into the division C2 process for close, deep, and rear operational support. The integration of engineer C2 activities at each division command node creates a responsive, synergistic relationship between division engineer operations, engineer unit C2, and division units. It must maximize the use of division C2 and engineer C2 channels to achieve responsive support. Timely and effective engineer task organizations, annexes, fragmentary orders (FRAGOs), operation orders (OPORDs), and operational updates are all products of effective integration of engineer missions and C2. Chapter 2 provides additional discussion on the integration of engineers and maneuver C2.

Engineer forces may also assist in hardening division C2 by constructing fortifications for critical division command, control, and communications (C3) nodes. Continuous, uninterrupted C3 is vital to maintaining the initiative and acting within the enemy's own decision cycle. As the battlefield becomes increasingly nonlinear, engineers play a more vital role in constructing or hardening existing facilities that give division C3 nodes an edge against the enemy's deep operations. The division engineer must be sensitive to these needs and must constantly coordinate with the division G3 and the communications-electronic signal officer (CESO) to identify C3 survivability requirements early.

The C2 system of the FXXI division enables the division commander to prioritize and allocate assets to employ and sustain combat power. The C2 system of the FXXI division is highly flexible and redundant, and it enables the synchronization and integration of combat, CS, and CSS operations. The enhanced SA generated through the display and sharing of fused critical real-time or near-real-time information using the ABCS enables the division commander to—

- Sense the total battle through enhanced battlefield visualization.
- Expedite his tactical decision making.
- Transmit his orders through digital systems.
- Exercise simultaneous control over his units in the deep, close, and rear areas.
- Move, mass combat power, and conduct precision maneuver using systems such as FBCB2 to take advantage of enemy weakness when and where the enemy least expects it.

The division engineer contributes to the synchronization of the division's combat operation by ensuring the rapid movement of the division's maneuver units and shaping the battlefield by canalizing enemy forces into predetermined areas where friendly units have a positional advantage. The division engineer uses his C2 systems to draw information from subordinate units and other BOSs. This information is used to analyze mission requirements, effect coordination, determine appropriate courses of action, and support the development of engineer force structures and task organizations required to support the division's tactical operations. These C2 systems are used to disseminate engineer missions, task organizations, annexes, FRAGOs, OPORDs, and operational updates. Engineer activities are planned and integrated by the division engineer and his staff at the DMAIN MOB cell. During mission execution, much of the engineer C2 is effected at the DTAC. At this location, the division engineer has greater access to current voice and digital information. He is better able to interact with the command group and provide proactive assistance and recommendations based on monitoring the actions/activities of subordinate commanders and their units. The division engineer maintains flexibility through the use of all C2 systems (voice and digital) and channels to maintain a high state of SA and provide responsive support to changing situations. (See FM 71-100, FM 100-5, and Chapter 2 of this manual for detailed discussions of C2.)

CHAPTER 2

Command and Control

Command and control of engineer units and functions is essential to providing the division with responsive engineer support. It enables the DIVEN commander to effectively integrate engineer battlefield functions into division plans as well as synchronize the effort involved in the current fight. This chapter focuses on establishing effective engineer C2 in the division. It draws on the C2 principles and structure outlined in FMs 101-5 and 71-100.

Engineer C2 involves the functional arrangement of personnel, equipment, communications facilities, and procedures to enable the DIVEN organization to keep pace with the division's decision cycle and accomplish assigned missions. Effective C2 and execution ensures that engineer capabilities are properly applied to gain the maximum combat multiplying effect.

In the FXXI division, there is no longer an engineer brigade commander. The division engineer's duties and responsibilities are those of a special staff officer. While the division engineer still serves as an advisor to the division commander on the missions and operations of engineers, he now coordinates and controls the organic engineers that remain under division control for the division commander. This includes the corps engineer units attached to the division. He ensures that DIVEN staff actions are fully planned, synchronized, and integrated into the division's operational plans. Digital systems used by the division engineer to effect the coordination and control of the division and attached corps engineer assets are ASAS, DTSS, and Raptor-ICO.

ROLES OF THE DIVEN COMMANDER

Leadership is a vital component of any C2 system. In an analog division, the DIVEN commander provides the purpose, direction, and motivation necessary for his soldiers to accomplish the difficult and dangerous tasks that support the combined arms team. His dual roles as both a commander and division staff officer provide some unique leadership challenges.

The relationship between the DIVEN commander and his division commander is important to effective C2 of engineers. The division commander formulates a concept of the operation, intent, and vision of the battlefield that cuts across all functional areas at his echelon. To help maintain his command focus, the division commander must rely on his functional area commanders to provide the necessary combat-, CS-, or CSS-specific control that permeates all subordinate echelons.

The division commander relies on the DIVEN commander as his expert on engineer operations. The DIVEN commander supports the division commander by commanding organic engineers that remain under division control and corps engineer units attached to his organization to support the division. As the division engineer, he assists the division commander in control of all engineer operations within the division as necessary to ensure responsive, effective, and cohesive support.

The DIVEN commander's primary role is command. He is assisted by a coordinating staff. The broad duties and responsibilities of commanders and coordinating staffs are outlined in FM 101-5. The principal functions of the DIVEN commander and his staff include—

- Commanding subordinate organic and supporting engineer units.
- Using engineer C2 organizations to hear, see, and understand all engineer battlefield missions within the division.

- Assigning specific missions to engineer units through DIVEN unit orders.
- Using engineer C2 organizations to hear, see, and understand all engineer battlefield missions within the division.
- Issuing timely instructions and orders to subordinate engineer units to facilitate subordinate planning, preparation, and integration.
- Assessing unit performance, anticipating changes, and issuing the necessary FRAGOs directly to the engineer unit.

The DIVEN commander is also the division engineer, a division special staff officer. He is assisted in this role by a special staff section under the leadership of the Assistant Division Engineer (ADE). The duties and responsibilities of the special staff and the division engineer are outlined in FM 101-5. The division engineer is responsible for functional control of both organic and supporting corps engineers. The division engineer supports the division commander in exercising functional control by—

- Visualizing the future state of engineer operations in the division.
- Formulating concepts for engineer support to meet the division commander's intent.
- Identifying the engineer tasks necessary to support the division plan.
- Developing and integrating future engineer plans to support the division fight.
- Coordinating with the corps engineer on corps engineer plans, status of division engineer missions, and identification of division requirements for corps engineer assets.
- Using the EBA and mission analysis to compute resource and force requirements for making recommendations for engineer task organization and command and support relationships.
- Developing a scheme of engineer operations concurrently with maneuver courses of action.
- Making recommendations to the division commander concerning priorities and risk.
- Developing specific engineer missions and conveying them to subordinate maneuver units and their staff engineer through the division OPORD and engineer annex.
- Monitoring the execution of engineer orders and instructions.
- Adjusting the engineer plan, as required, based on feedback from both maneuver and engineer units.
- Identifying engineer requirements beyond the capability of available units and requesting additional assets from corps, as needed.

In his dual roles, the DIVEN commander assists the division commander by monitoring the total engineer fight, anticipating problems, providing timely recommendations, and participating in future planning while continuing to command all engineers under division control. To accomplish all of these tasks, the DIVEN commander positions himself, his staff, and his representatives where they can best provide C2 of engineers and engineer functions for the division commander. In his role as commander, the DIVEN commander may be at the scene of the engineer main effort while his staff continues the effort in the DIVEN command posts (CPs). As the division engineer, he must be accessible to the division's decision makers. He does this by ensuring that his coordinating staff and representatives at the division CPs fully understand both his and the division commander's intent and are aligned for mutual support and synchronization.

The DIVEN commander must achieve an efficient and flexible C2 system in the division. While FM 71-100 provides a base C2 structure, each division commander modifies that structure based on his personality and leadership style. The DIVEN commander must identify the division's decision makers and the key decision-making nodes. For example, some division commanders may make heavier use of the command group or increase the role of the TAC CP in decision making for future fights. Each DIVEN commander must make an assessment of his division's C2 "personality" and modify his engineer C2 system accordingly. C2 of engineers must be responsive to the needs of the division commander as well as those of subordinate engineer units.

The DIVEN commander must establish a clear delineation of functions and responsibilities in order to influence and keep pace with the division's decision cycle. The cycle of acquiring information, making recommendations and decisions, issuing instructions, and ensuring engineer actions are set in motion is a continuous process requiring organization and efficiency.

The DIVEN commander issues guidance to his staff and division representatives and makes tactical decisions based on guidance and coordination with the division commander. He must maintain flexibility to move to the point of the engineer main effort or to the point of decision making.

To provide responsive engineer support to a division, the DIVEN commander must properly task organize his force. He fosters the integration of subordinate units through habitual association with the maneuver brigades. He uses this habitual relationship as a basis for task organization wherever possible.

The division will frequently need and receive additional engineer units from corps. These units are integrated into the overall division task organization. Corps units may be task organized into or along with the division's organic engineer units supporting the maneuver brigades or may be given independent missions in the division area.

The chief purpose for task organizing is to increase the responsiveness of support to the maneuver brigade commanders. Commanders of task-organized engineer units (attached, operational control (OPCON), or direct support (DS)) must answer to the needs of the supported commander first. Even in cases where engineer units are general support (GS) and receive their missions from corps, they still attempt to satisfy the needs of the supported commander.

The DIVEN commander gives his subordinates missions and guidance supporting the missions the division commander gives to his maneuver brigades. The DIVEN commander must afford his subordinates a great deal of freedom of action and initiative. He must remain focused on engineer missions rather than the method of execution. He uses intent to give subordinate engineer commanders the necessary framework within which to take initiative. Freedom of subordinate action, mission focus, and clear intent are all vital components of establishing effective engineer C2 between the DIVEN commander and engineers task organized to maneuver brigades.

ROLES OF THE FXXI DIVISION ENGINEER

The commander of a FXXI division will utilize the DIVEN to accomplish all coordination and sychronization with engineer assets tasked to support the division. This includes engineers from theater, corps, division and specialized civilian engineer resources. The division engineer coordinates, synchronizes, and integrates engineer actions to ensure cohesive and responsive support. The division engineer also—

- Visualizes the future state of engineer operations in the division by developing and maintaining SA and an RCP of the battlefield. This is accomplished by monitoring C2 voice systems and the digital information derived from the MCS (friendly situation), ASAS-RWS (enemy situation), and CSSCS (logistics).
- Anticipates change and formulates concepts for engineer operations and support to meet the division commander's intent and scheme of maneuver. This is accomplished through the vertical and horizontal sharing and dissemination of plans and orders, combat, and logistics information via Mesh Net, MCS, and CSSCS.
- Prepares an Engineer Annex to the division order to facilitate coordination of timely orders (OPORD, warning order (WARNORD), FRAGO) and/or instructions to subordinate engineer units through both voice and digital systems to facilitate coordination, planning, preparation, and rehearsal of engineer actions/activities in support of division operations.
- Uses MCS to monitor and assess engineer progress and performance during mission execution.
- Conducts the necessary digital cross talk and manual interfaces with the command group staff elements and supporting engineer elements during development of division plans and engineer estimates to ensure that all engineer actions/activities are properly identified and tasked to support current and future operations of the division. This includes—
  - Coordinating with the corps engineer on plans and support capabilities.
  - Using the engineer estimate and mission analysis to compute resource and project future requirements.
  - Developing a scheme of engineer operations that supports the division and MCS maneuver.
  - Prioritizing requirements and conducting risk assessments.
  - Developing and tasking specific engineer missions through the G3.
  - Monitoring compliance with orders and execution of engineer missions.

THE FXXI DIVISION ENGINEER STAFF ELEMENT

To accomplish his coordination and control duties, the division engineer establishes a staff element that fulfills engineer functions at both the DMAIN and DTAC. The division engineer operates freely from both of these locations based on the division commander's needs and his need to anticipate engineer requirements and recommend engineer efforts and operations. The exact composition and span of control effected by the DMAIN and DTAC MOB cells are METT-T dependent. These staff elements provide engineer presence and influence at critical locations on the battlefield and have the authority to make timely decisions in concert with or at the direction of the division engineer.

In the FXXI division under the conservative heavy division (CHD) structure, the engineer functions of the ADE have been realigned. Under CHD, the ADE is in charge of the DMAIN MOB cell. In this context, the ADE works in close collaboration with the division engineer related to development of the scheme of engineer operations and assumes his duties in his absence (see Appendix A). As an advisor, coordinator, and synchronizer of engineer actions/activities, he establishes close working interfaces with the information/intelligence/plans cell (IIPC) and the sustainment, targeting, and fires cells to ensure that—

- Critical engineer missions are identified and resourced.
- Engineer assets providing support in the division's AO are provided security and force protection.
- Engineer elements are properly task organized to accomplish the assigned mission.
- Engineer tasks are properly allocated to the engineer element best equipped to perform the tasks.
- Engineer plans are integrated and synchronized with the division's current, future, and rear operational plans.
- Engineer annexes of division OPLANs, OPORDs, and FRAGOs accurately reflect engineer requirements, missions, and tasks.
- Topographic products (maps and data sets) and terrain analysis are provided to the G3 and others of the division on an as-needed basis.

To facilitate the parallel planning process, the ADE will effect internal and external coordination within the DMAIN and maintain close contact with the DTAC MOB cell and adjacent and higher headquarters via manual interface, landline, frequency modulated (FM) voice, and digital links. He also requests and receives information from higher, lower, and adjacent units. In this context, the ADE serves as a clearing-house for the dissemination of tactical information received from lower, higher, and adjacent units that is related to friendly and enemy engineer operations. Hence, he is responsible for monitoring, tracking, and maintaining intelligence and logistics data that clearly define a picture of the battlefield as well as engineer operations and support capabilities. As part of this process, the ADE will maintain, analyze, fuse, and disseminate information of critical importance to DMAIN and corps planners relative to ongoing and future engineer operations.

NOTE: Information should be disseminated vertically, horizontally, and laterally via digital means with receipt confirmed by voice or digital means.

In a FXXI division, a terrain detachment is habitually attached from corps and is responsible for all topographic support to the division. The team works for the division engineer and is task organized to support the DTAC, DMAIN, and each maneuver brigade (see Figure 2-0). The terrain detachment works with the division staff to plan operations and integrate terrain analysis products into the IPB process. The detachment is responsible for terrain-analysis support to the division, including collecting, analyzing, integrating, and disseminating the division's topographic database. Additional capabilities include tailored terrain-analysis products and database management, information provided to the commander on the common topographic operating environment, and the effects of terrain and weather on the battlefield and mission operations.

ENGINEER FUNCTIONAL AREA C2

The responsibility to provide engineer control is key to establishing an effective engineer C2 organization. To effectively control the engineer effort, the division engineer must understand the division C2 organization and integrate engineer operations into the division's planning and decision cycle.

An analog division normally commands and controls the fight through a command group and three CPs. The CPs are the TAC CP, main CP, and rear CP. FM 71-100 provides details on the exact composition and layout of the command group and each CP. While these details are important, it is more important to understand the roles and responsibilities of each CP within the division's C2 organization.

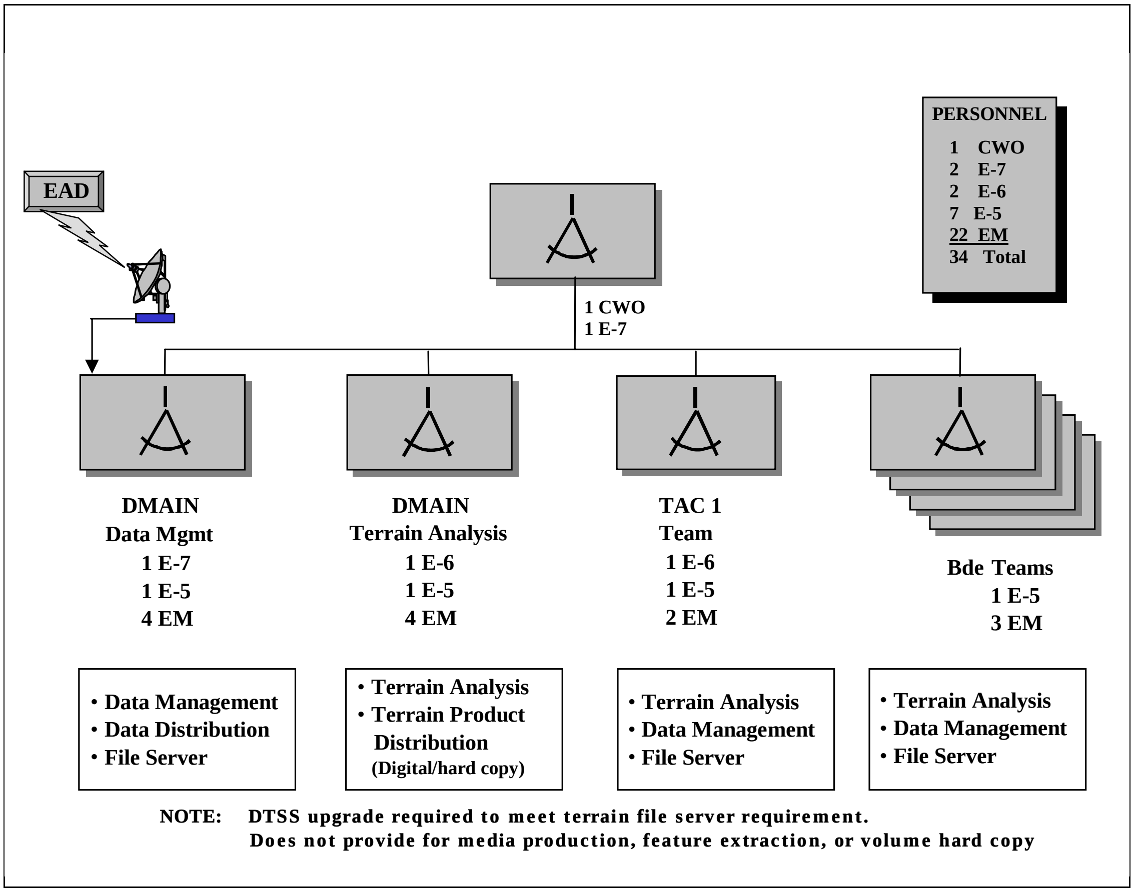

Figure 2-0. Division terrain detachment teams

The FXXI division's primary command posts are the tactical (DTAC) command post and the main (DMAIN) command post. The assistant division commander for support (ADC-S) from the security and sustainment operations center (SSOC) synchronizes the division sustainment area. The division main command post contains those elements that permit the commander to visualize the battle in sufficient detail and depth to enable him to position his CSS elements. The FXXI division staff is organized under the general staff concept. Related tactical operations are grouped together in cells for further dispersion on the high intensity battlefield to enhance survivability. Digitization allows for effective management of greater quantities of friendly and enemy information. The DMAIN promotes efficiency and staff coordination and ensures that the commander's intent is implemented and executed. The division tactical command post synchronizes combat operations for the close battle, monitors battlefield circulation, and implements contingency plans. This includes the dissemination of close operations or the friendly situation and the common operating picture. Continuously exchanged information between the DTAC and DMAIN enhance the maintenance of a common operating picture and the current enemy situation.

Functionally, the division TAC, main, and rear CPs are the same in every division. The engineer functions are also the same, regardless of the type of division. The actual size, composition, and organization of each engineer cell adjusts, based on the type of division, to provide an acceptable level of engineer unit control. Understanding how the division CP system works and what engineer functions occur at each of the division CPs is fundamental to establishing C2 of engineers. Figure 2-1 illustrates the relative battlefield location of each division CP. This only provides a base structure; each division may modify its C2 organization based on the personality of the commander and METT-T.

Engineer C2 architecture in the FXXI division involves the functional arrangement of personnel, equipment, communications, and procedures to enable the division engineer to plan, synchronize, and integrate engineer missions and plans with that of the supported division. This architecture also enables the coordination and control of engineer missions and mission accomplishment and capitalizes on engineer operations as a combat multiplier. In the FXXI division, operations are conducted from the DTAC and DMAIN with rear operations conducted from the SSOC collocated with the DMAIN sustainment cell.

The functions performed between the FXXI and non-FXXI CPs do not differ appreciably. However, the techniques and procedures used to accomplish command and staff tasks do differ. For example, those divisions transitioning from analog to digital operations will find that the composition, structure, and personnel positioning within the CPs will change.

The more robust ability to electronically acquire, store, move, and display large amounts of information within and between FXXI CPs, using the ABCS and other FXXI systems, requires a thorough validation of existing CP techniques and procedures.

Division Command Group

The command group consists of the division commander and selected members of his staff. It is not a fixed organization but is tailored to meet the C2 needs of the mission.

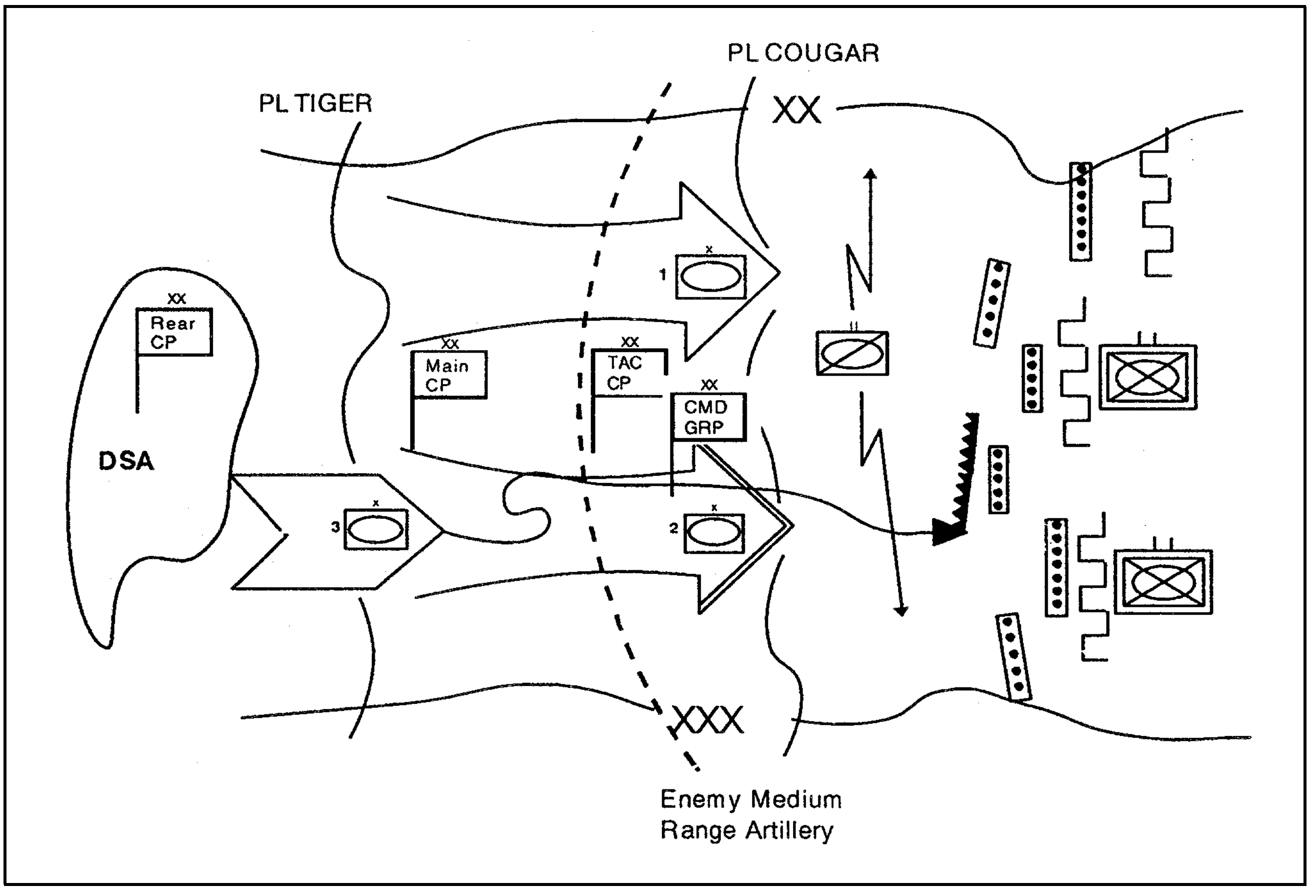

Figure 2-1. Division command and control posts

The division commander identifies the critical events requiring his personal influence. He also anticipates the rapid decisions and orders that will be required and tailors the command group to provide the necessary expertise. The command group moves forward from the TAC CP and initially positions itself with the main effort. This forward position allows the division commander and selected staff to see the battle, directly influence the action, and make face-to-face contact with brigade commanders when necessary. The division commander will often require the division engineer to be part of his command group.

With digital systems, the division commander may exercise C2 from the DMAIN command information center (CIC) or from a mobile platform such as the command and control vehicle (C2V) or Army Airborne Command and Control System (A2C2S). The command group consists of the division commander and his executive support personnel (G3, fire-support coordinator (FSCOORD)), air liaison officer (ALO), and G2).

Division TAC CP

***Functions* of *the TAC CP*.** The TAC CP controls the close fight. It locates in the main battle area (MBA) close to the forward brigades. It is structured to synchronize and coordinate maneuver, fire support, and engineer operations in the division close battle. When fully active, the TAC CP serves as the net control station (NCS) for brigade and separate battalion reports. It receives, posts, and analyzes reports from the maneuver brigades and responds to immediate tactical requirements. The TAC CP is principal to analyzing and disseminating combat intelligence for the close fight. It also provides centralized synchronization of fires to committed forces within the division. The ADC-M or his designated representative controls the TAC CP.

***Engineer Functions in the TAC CP*.** The division TAC CP concentrates on the C2 of the current close fight. The focus of engineer functions in the TAC CP is to provide the ADC-M and the division engineer with information about the engineer close current fight that is needed for making timely decisions. Engineer representatives in the TAC CP—

- Track friendly and enemy obstacles.
- Coordinate the execution of the division's scheme of engineer operations in the close fight.
- Synchronize the unity of engineer effort among maneuver brigades.
- Provide engineer expertise to the ADC-M.
- Receive, post, and analyze combat intelligence affecting current engineer operations and provide input to the current IPB.
- Receive, post, analyze, and forward reports on current engineer operations from maneuver brigades in the close fight.
- Provide engineer expertise to the TAC fire-support element.

As part of the parallel planning process, the TAC CP engineer closely monitors FRAGOs from corps and guidance given by the division commander for the future fight. Based on the commander's guidance, the TAC CP forwards engineer guidance to engineer planners in the main CP. The TAC CP engineer also assists the division engineer in identifying critical engineer events, engineer tasks, and resource requirements for the future close fight by maintaining an accurate status of engineer operations in the close fight.

FXXI Division TAC

The core function of the FXXI tactical command post (DTAC) is to monitor and synchronize the current fight. Key to DTAC functionality is the presence of the assistant division commander-maneuver (ADC-M). He supervises DTAC operations and coordinates the division's operations. The DTAC is forward on the battlefield and requires a greater degree of survivability than the

DMAIN. It is tailorable to give the commander the ability to add or subtract functional elements. The DTAC supports collaborative staff actions with the DMAIN and subordinate units. C4I equipment as shown in Figure 2-1a (FXXI division TAC) support this.

Engineers in the DTAC (M/S element) provide the commander with recommendations and assessments of engineer efforts in the close fight. The team monitors, coordinates, and synchronizes the activities of both the divisional and nondivisional engineer assets. An embedded engineer team conducts reconnaissance to continuously update the division's knowledge base, ensuring that the common operating picture reflects all obstacles (both friendly and enemy) and trafficability information concerning the AO.

The DTAC is digitally equipped with direct broadcast satellite (DBS)/battlefield awareness and data dissemination (BADD). The digital systems provide the command group with a detailed near-real-time SA of the battlefield from both friendly and enemy perspectives. Information internal to the DTAC is shared via local area network (LAN) systems, manual interfaces, or mesh net radio. Information is disseminated (pushed) and shared (pulled) to and from the DTAC via LAN/FTP, FM radio, battlefield video teleconferencing (BVTC) white board, variable message format (VMF) and or United States message text format (USMTF) messages.

Main CP

Functions of an Analog Main CP. The nucleus of the division C2 organization is the main CP. The main CP is designed to provide the division with the capability of "seeing the total battlefield" in the current fight while simultaneously planning for future fights. For the current fight, the main CP prepares and issues FRAGOs, develops sequels and

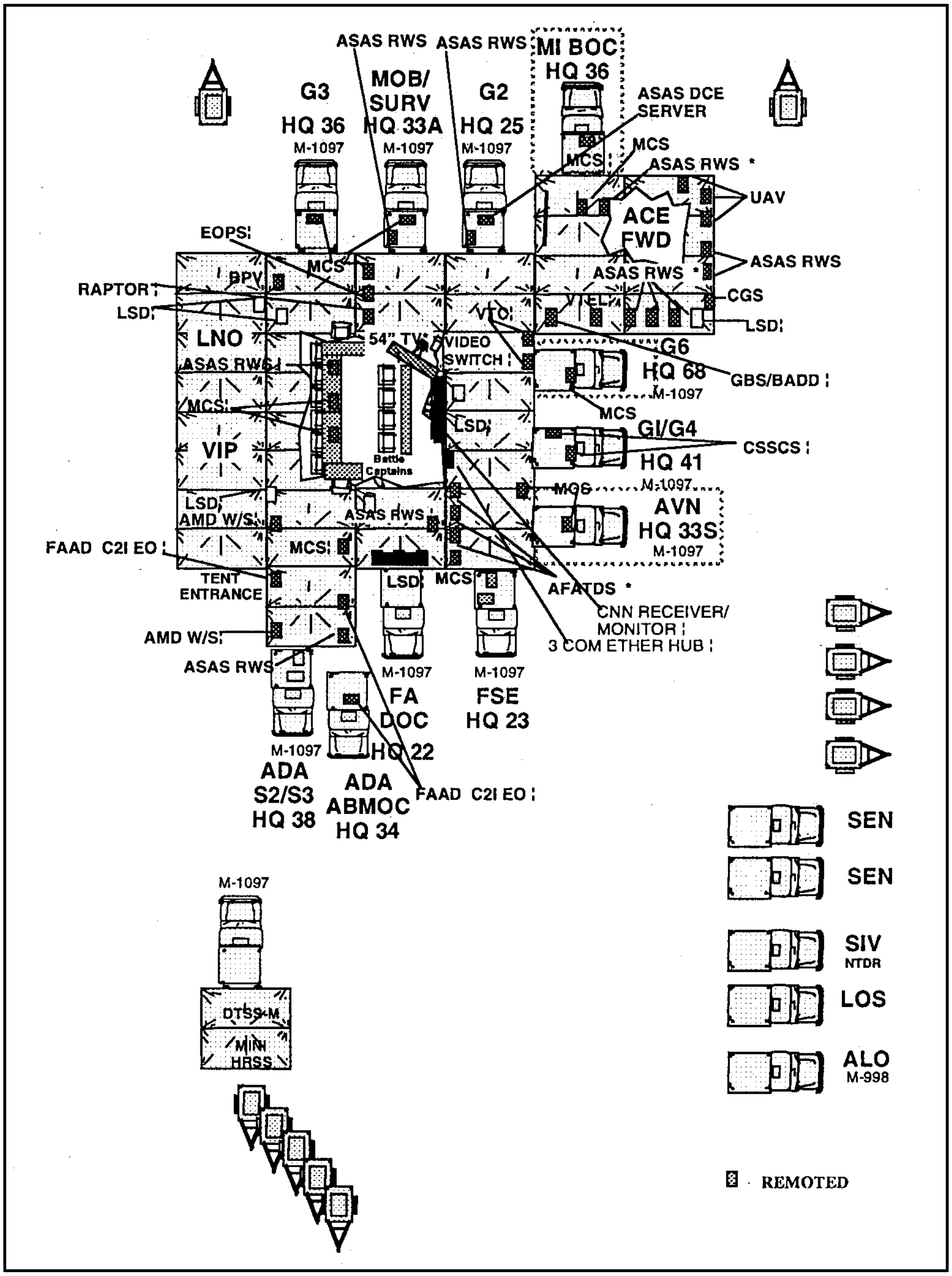

Figure 2-1a. FXXI division TAC

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branches for current fights, and coordinates the allocation of resources and establishment of priorities. The main CP sees the battle through reports from the TAC CP, rear CP, and subordinate units. The majority of the information arriving at the main CP is normally historical and insufficient to make timely, tactical maneuver decisions. Therefore, the role of the main CP in the current fight is to respond to requests for immediate support by the TAC and rear CPs. The main CP also ensures that decisions made by the TAC and rear CPs are rapidly coordinated and effectively conducted. The main CP must also be prepared to control the close fight if the TAC CP is unable to do so. The main CP controls the conduct of the deep fight in coordination with the TAC CP to ensure synchronization with the close fight. The main CP also monitors the operations of higher and flank units and provides the information to the TAC and rear CPs.

The main CP is the central C2 node for planning future deep, close, and rear fights. It has three functional cells: the command cell, the G3 cell, and the G2 cell. The command cell contains and is responsible for the command center vehicle and the division commander's command group. The G3 cell contains the G3 operations, plans, engineer, fire-support, air defense artillery, aviation brigade, airspace command and control (A2C2), assistant division signal officer (ADSO), and nuclear, biological, chemical (NBC) elements. The G2 cell contains the G2 operations, all-source production section (ASPS), weather, and topographic elements.

Engineer Functions in an Analog CP. In concert with its role as the nucleus of division C2, the main CP is also the center of gravity for all engineer functional planning. The division engineer's principal representative in the main CP is the ADE. The major engineer functions are—

- Tracking all mobility, countermobility, survivability, and sustainment and topographic engineering aspects of current deep, close, and rear fights.
- Receiving, posting, and analyzing terrain, enemy engineer, and other intelligence and participating in the IPB for future plans.
- Identifying engineer resources required to support deep, close, and rear fights for future plans.
- Developing the division's scheme of engineer operations to support all courses of action for future plans.
- Processing requirements received from the TAC and rear CPs and integrating them into future plans.
- Synchronizing and integrating engineer plans with future division plans.
- Preparing engineer input for division operation plans (OPLANs) and OPORDs.
- Coordinating and transferring information with adjacent division engineers and the corps engineer.

The ADE must conduct close coordination both internal and external to the main CP. The ADE relies heavily on reports from the TAC and rear CP engineers and the DIVEN MAIN CP. He also closely coordinates with the G2 cell and the G3 plans, operations, and fire-support elements to see the total battle and integrate into future plans.

The ADE assists the G3 operations element in synchronizing engineer operations in the current close and rear battles and in responding to immediate engineer tactical requirements. As the current fight develops, the TAC CP receives requests for immediate support from the maneuver brigades. The ADC-M makes decisions, issues FRAGOs to the brigades, and forwards his decisions to the main CP for coordination. When those decisions involve engineer operations or forces, the TAC CP engineer ensures the decision and requirements are passed to the main CP. The ADE works closely with the operations element to completely resource and synchronize the decision to support the current fight. The main CP also receives requests for immediate tactical support from the division rear CP. The assistant division commander for support (ADC-S) makes decisions for adjustments to the current rear fight. Likewise, when these requests involve adjustments to the scheme of engineer rear operations, the rear CP engineer ensures that the requirements are forwarded to the main CP for coordination by the ADE.

The ADE tracks intelligence reports from corps, the TAC and rear CPs, and the DIVEN MAIN and identifies information essential to engineer operations. The ADE uses this information to participate in the IPB as well as to refine or develop the engineer estimate for the current and future fights. The ADE must also ensure the information is passed to the TAC and rear CP engineers as well as the DIVEN MAIN.

The ADE monitors current engineer operations and coordinates with adjacent and higher engineer headquarters. He maintains the necessary data base to pass critical engineer information to adjacent or relieving units, as required. He also requests and receives engineer information requirements from adjacent and higher organizations. Figure 2-2 illustrates the functional control concept for the current fight.

The ADE works with the G3 plans element of the main CP in developing future plans,

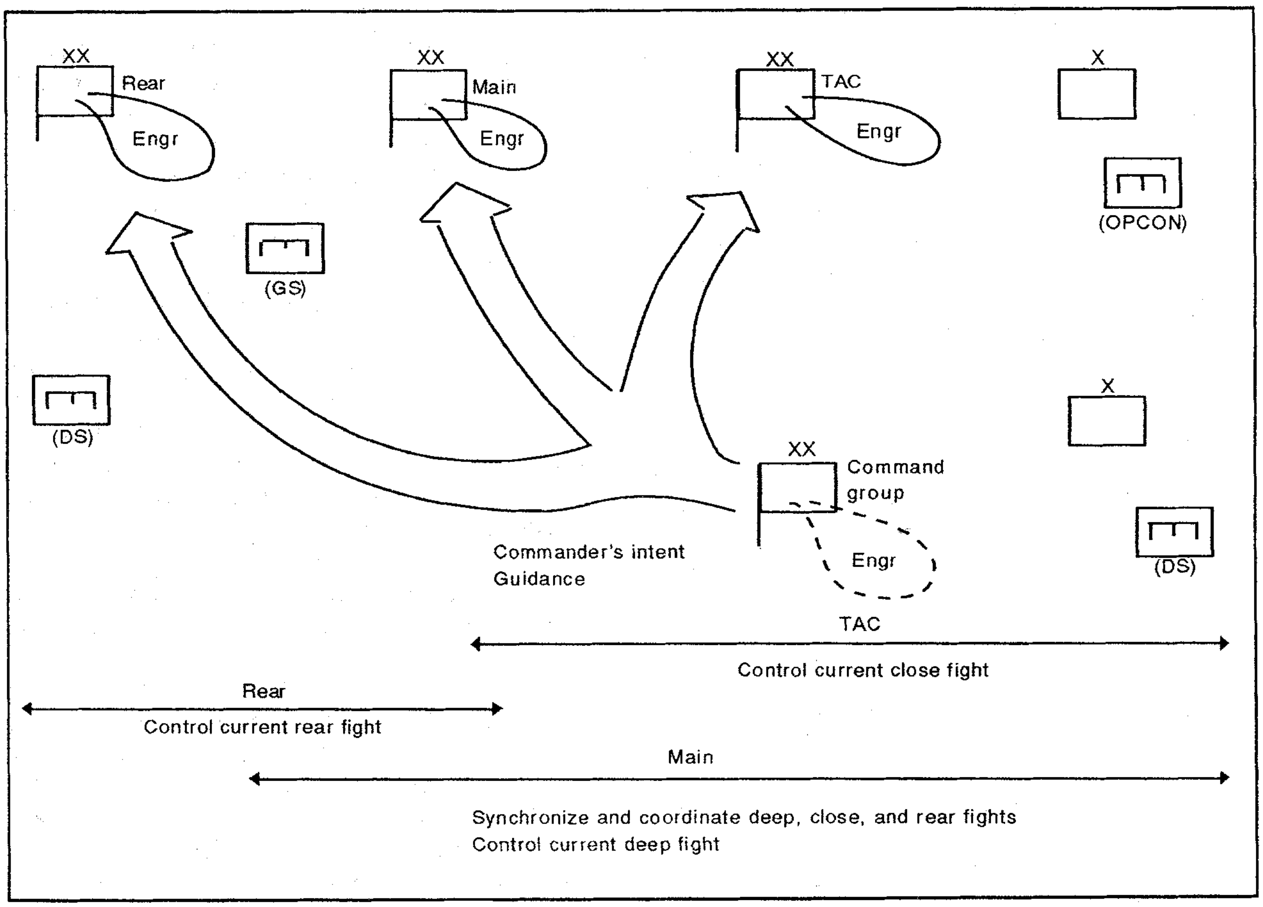

Figure 2-2. Functional control: current

integrating engineer operations to support the future fight, and allocating the necessary engineer forces. When the division receives a FRAGO, the ADE assists the plans element in processing the order and gathering the information necessary for future planning.

Just as the plans element receives guidance on the future fight from the command group, the ADE receives engineer guidance from the division engineer. The ADE develops the scheme of engineer operations for courses of action developed by the plans element. In developing the scheme of engineer operations, the ADE considers the engineer requirements to support all aspects of the future fights (deep, close, and rear). The ADE works closely with the plans element in identifying critical engineer missions, allocating the necessary engineer forces, and recommending an engineer task organization. The ADE prepares engineer input to the division base OPORD, OPLAN, or FRAGO and prepares the engineer annex, where required. To facilitate parallel planning, the ADE coordinates with the TAC and rear CP engineers and the DIVEN MAIN as the plan develops. Figure 2-3 illustrates the functional control concept for the future fight.

FXXI Division Main

The FXXI DMAIN is the primary planning headquarters for the division. (Figure 2-3a depicts an example of a configured DMAIN CP.) Staff leaders at the DMAIN, under the direction of the CofS, sustain current operations and provide continuity of operations for the division. They are responsible for creating, maintaining, and tailoring the COP; marshaling support for the division's operations; coordinating with other headquarters;

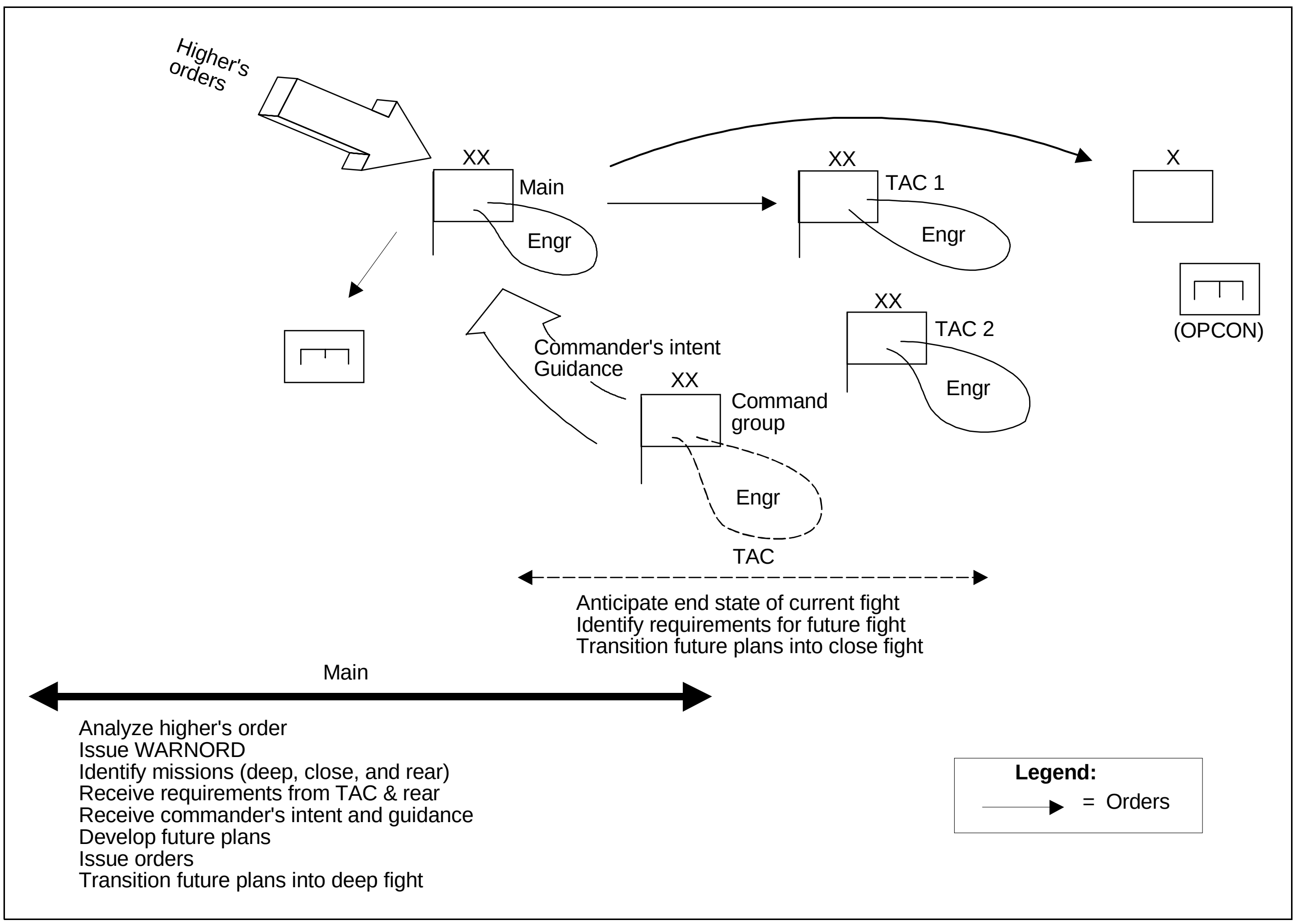

Figure 2-3. Functional control: future

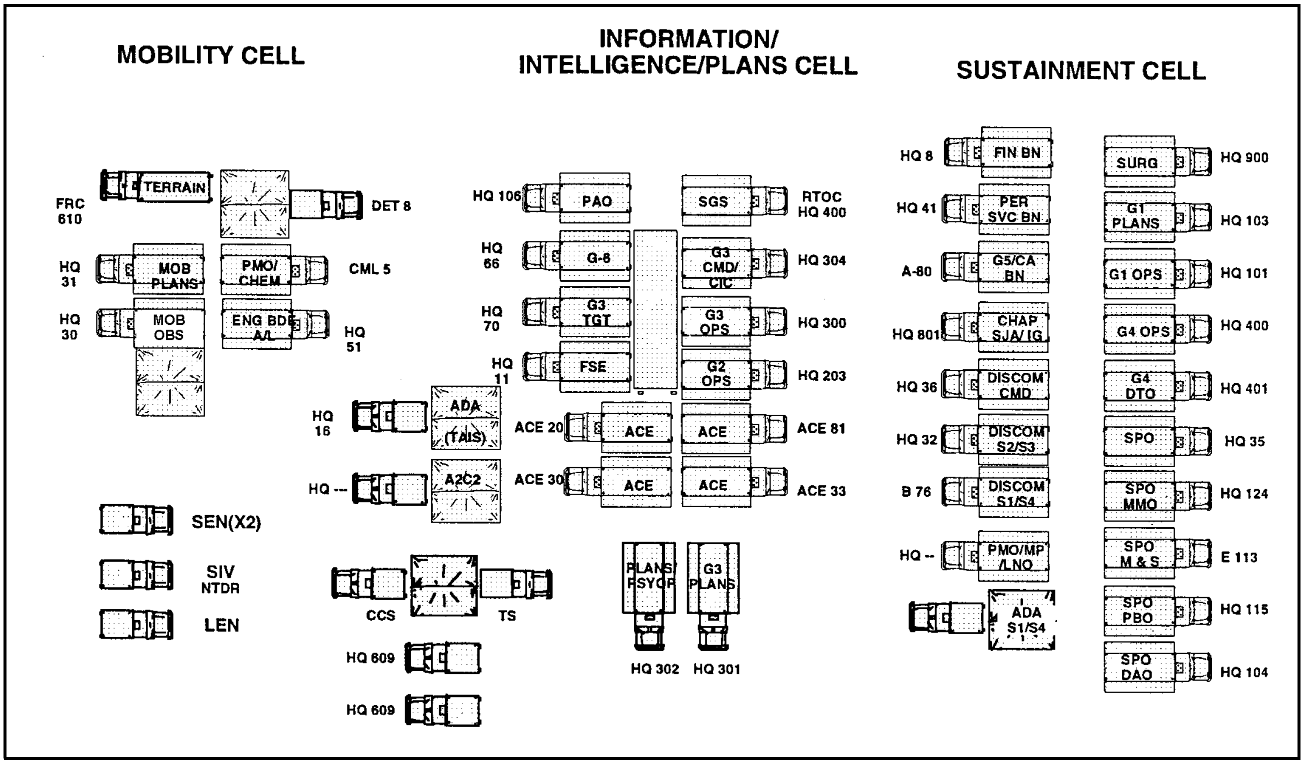

Figure 2-3a. FXXI DMAIN CP

planning future operations; and issuing plans and orders. Specific functions of the DMAIN include—

- Monitoring and tracking all current operations.
- Planning deep operations and information operations.
- Planning for all future operations.
- Obtaining and allocating resources.
- Planning and refining targeting.
- Coordinating, integrating, and synchronizing current and future operations.
- Maintaining the division knowledge base.

The command information center (CIC) is the central node for directing operations. The CofS, G3 Ops, G5 and G6 representatives, and the PAO normally man the CIC. Staff section chiefs provide the information required by the CofS to the CIC displays that depict the current or near-future situations. The specific responsibilities of the CIC include—

- Ensuring overall integrity of the COP.
- Establishing operational priorities.
- Overseeing the division database.
- Keeping the TAC free to fight the current operation.
- Issuing orders.

MOB Cell

The engineer plans and operations section at the DMAIN is under the C2 of the ADE. This section works in close collaboration with the DTAC MOB cell for coordination and control of engineer actions supporting the division. The section also maintains a close working interface with the corps engineer section for coordination of additional engineer augmentation. This cell assists the DTAC in the maintenance of a high state of SA related to engineer operations data (friendly and enemy) obtained through the MCS-ENG, ASAS-RWS, and DTSS. For example, the engineer plans and operations section conducts an analysis of spot reports (SPOTREPs) and engineer situation reports (SITREPs) gathered from friendly elements. The section refines or confirms these reports using other intelligence data derived from air and ground sensors or the BVTC. The BVTC white board is frequently used to conduct coordination of engineer tasks and missions with subordinate engineer elements. Planning conducted and products produced at the DMAIN by the engineer plans and operations and the topographic section are instrumental to mobility, countermobility, terrain analysis, IPB, EAB, and target development. To facilitate the shaping of the battle space, the engineer plans and operations section identifies Raptor ICO, Gator, Remote Antiarmor Mine System (RAAMS), Air Volcano, and aerial denial artillery munitions (ADAMs) sites and tasks their employment. This section also tracks the status of breaching resources to ensure that breaching systems are available to support sustainment operations. For example, the terrain analysis team and G2 provide intelligence (ASAS-RWS) and topographic products (DTSS) to the engineer plans and operations section for the development of the modified combined obstacle overlay (MCOO).

Rear CP

Functions of the Rear CP in an Analog Division. The rear CP focuses on the C2 of all elements located within the divisions rear and synchronizes the rear fight for the division. Because the rear CP is not manned or equipped to conduct the current fight and to plan for future rear fights simultaneously, it is only an extension of the main CP. The rear CP normally collocates with the division support command (DISCOM) CP within the division support area (DSA). The ADC-S is normally in charge of the rear CP.

The rear CP's primary role in the division C2 organization is to ensure that the rear fight is synchronized and integrated with the close and deep fights. The rear CP monitors the status of rear area combat and sustainment operations. Units operating in the rear CP area provide operational and unit status reports to the rear CP. The rear CP deconflicts unit movements within the division rear area where needed and controls them when required. The status of the rear fight and units is reported to the main CP. This information is vital to the main CP's development of future plans.

The rear and DISCOM CPs jointly analyze future division plans for their impact on current and future rear fights. This enables them to ensure that the necessary sustainment support is available. The rear CP is also responsible for planning, coordinating, and synchronizing rear security. It assigns units to bases or base clusters and appoints commanders for each. The rear CP also controls the tactical combat force and integrates it into the rear defensive plan. The rear CP monitors activities in the brigade rear areas, the adjacent division rear areas, and the corps rear area to prevent potential conflicts. Lastly, the rear CP may assume control of the current close fight, if augmented, when the main and TAC CPs can no longer function.

Engineer Functions in the Rear CP. The rear CP normally requires engineer staff support due to the diversified engineer battlefield functions that occur in the division's rear area. Those functions include—

- Providing engineer advice to the ADC-S.
- Making recommendations on engineer requirements to support base and base cluster defenses.
- Identifying engineer requirements for sustainment engineering, terrain management, movement control, and force protection.
- Preparing to assume the duties of the ADE if the rear CP assumes the main CP's mission.

- Controlling rear engineer operations for the ADC-S.
- Receiving, analyzing, and posting information on current engineer operations in the rear area and ensuring engineer reports are forwarded to the main CP.
- Coordinating logistics operations for engineers operating in the division rear.

The rear CP engineer provides the ADC-S with the engineer expertise he needs to plan, execute, and synchronize the division rear fight. He also provides the ADC-S with the information and expertise he needs to make immediate tactical decisions on the current rear fight. When his decisions involve engineer operations in the rear area, the rear CP engineer recommends the necessary adjustments in engineer support.

The rear CP engineer also assists the rear CP in analyzing future plans to ensure that the necessary sustainment support is available for the future fight. Specifically, the rear CP engineer looks at the engineer missions required in the rear area to sustain the division. The rear CP engineer also provides the rear CP with countermobility, survivability, and force protection expertise in planning base and base cluster defenses. The rear CP engineer identifies the resource requirements for future sustainment engineering, base cluster defenses, and force protection to the ADE. Furthermore, the rear CP engineer identifies engineer logistics issues for the DISCOM and rear CPs that affect the ability of engineer units to perform missions in the future fight.

Finally, the rear CP engineer assists the rear CP in tracking all aspects of the current fight in the event it has to assume control of the battle. Therefore, the rear CP engineer must maintain situation maps and track critical engineer information parallel with that of the ADE and the DIVEN MAIN so that he can assume the duties of the ADE, if required.

In the FXXI division, the rear CP has been eliminated, but the functions remain. Rear area functions are commanded and controlled from a SSOC at the DMAIN. The SSOC will be collocated with the sustainment cell or the IIPC, based on the situation. When collocated with the sustainment cell, the ADC-S, with assistance provided by the DISCOM commander, exercises C2 of rear area operations from this cell.

Combining missions and functions under the CHD structure blurred command authority in the rear area. Therefore, C2 and sustainment concepts are still emerging. As a result, rear area functions (security, terrain management, movement control, and sustainment) are synchronized and integrated through the development of the SSOC concept.

The SSOC is comprised of, but not limited to, the provost marshal office (PMO), rear tactical operations center (RTOC), tactical operations center (TOC), distribution management center (DMC), and augmentee cells (such as civil affairs (CA), psychological operations (PSYOPS), tactical combat force (TCF), battle damage repair (BDR), and others as needed). Figure 2-3a, page 2-9, illustrates the FXXI DMAIN with the SSOC collocated with the IIPC.

Engineer functions typically performed in the rear area relate to mobility, survivability, topographic, and general engineering operations. The coordination of engineer support in the rear area is coordinated via the digital systems within the DMAIN MOB cell and sustainment cell with the SSOC.

ENGINEER C2 ORGANIZATION

In an analog division, the DIVEN commander provides C2 for his subordinate units. This requirement is the same in all types of divisions. The DIVEN organization C2 structure and its location on the battlefield are determined by the—

- Diversity of the engineer battlefield functions required.
- Current mission.
- Division's C2 structure.
- Location of subordinate units on the battlefield.
- Task organization and command-and-support relationships of subordinate units.
- Logistics requirements of subordinate units.

To accomplish his unit C2 responsibilities, the DIVEN commander establishes a basic C2 structure consisting of a command group and three CPs: the DIVEN MAIN, the DIVEN TAC, and the DIVEN REAR. The DIVEN commander adjusts the organization, personnel, procedures, and equipment of his C2 structure based on his own METT-T analysis of each mission. The foundation of the functions and operations of the command group and CPs is contained in FM 101-5.

DIVEN Command Group. The command group consists of the DIVEN commander and designated members of his staff. The command group's location, exact composition, and span of control are mission dependent. Their focus remains on the C2 of the current fight. The DIVEN commander uses his command group to influence the fight through the personal leadership of each member. They provide command presence at critical locations on the battlefield and should have the authority to make timely decisions on behalf of the DIVEN commander.

DIVEN TAC. The DIVEN TAC, when deployed, is the forward-most engineer CP. Its functions include—

- Assisting the DIVEN commander in commanding and controlling his subordinate units supporting the close fight.
- Providing information about the close fight to the DIVEN MAIN.
- Assisting the division TAC CP engineer, when required.

The DIVEN TAC will normally be deployed when the DIVEN commander needs to exert greater forward C2 on subordinate units to support missions such as river-crossing operations, large-scale breach operations, relief-in-place missions, and the execution of preplanned obstacles prior to the deployment of maneuver forces. The DIVEN TAC may also deploy when the required engineer functions at the division TAC CP exceed the capability of the TAC CP engineer to perform them. The DIVEN TAC must maintain communications with the DIVEN MAIN and the division TAC CP engineer. It must be capable of conducting continuous operations.

DIVEN MAIN. The DIVEN MAIN is the center of engineer unit synchronization of the current deep, close, and rear fights and planning for future fights. It provides the DIVEN commander with the ability to see the entire battlefield. The functions of the DIVEN MAIN include—

- Commanding and controlling all subordinate units.
- Developing intelligence.
- Tracking the current battle.
- Collating information for the commander.
- Coordinating support for subordinate units.
- Providing reports to the division.
- Planning the future fight.
- Developing and issuing engineer unit orders.
- Assisting the ADE when required.

The DIVEN MAIN is normally located close to the division main CP to facilitate coordination and communication with the division and to support the ADE when the required engineer functions at the division main CP exceed the capability of the ADE to perform them. The DIVEN MAIN must also maintain communications with the DIVEN command group, DIVEN TAC, DIVEN REAR, and the ADE. The DIVEN MAIN exercises C2 of the current fight when the DIVEN TAC is not deployed. It must be capable of conducting continuous operations.

DIVEN REAR. The DIVEN REAR is located close to the division rear and DISCOM CPs in the division's rear area. Its functions include—

- Commanding and controlling subordinate units supporting the rear fight, as required by the DIVEN commander.
- Coordinating CSS for the DIVEN organization.
- Acting as the alternate DIVEN MAIN CP.
- Assisting the division REAR CP engineer, when required.

The DIVEN REAR may be formed from DIVEN organization assets, a supporting corps engineer unit headquarters, or a combination of both. The DIVEN REAR must maintain communications with the DIVEN MAIN and the division rear CP engineer. The DIVEN REAR may also assist the division rear CP engineer when the required engineer functions at the division rear CP exceed his capability to perform them. It must also be capable of continuous operations (Figure 2-4).

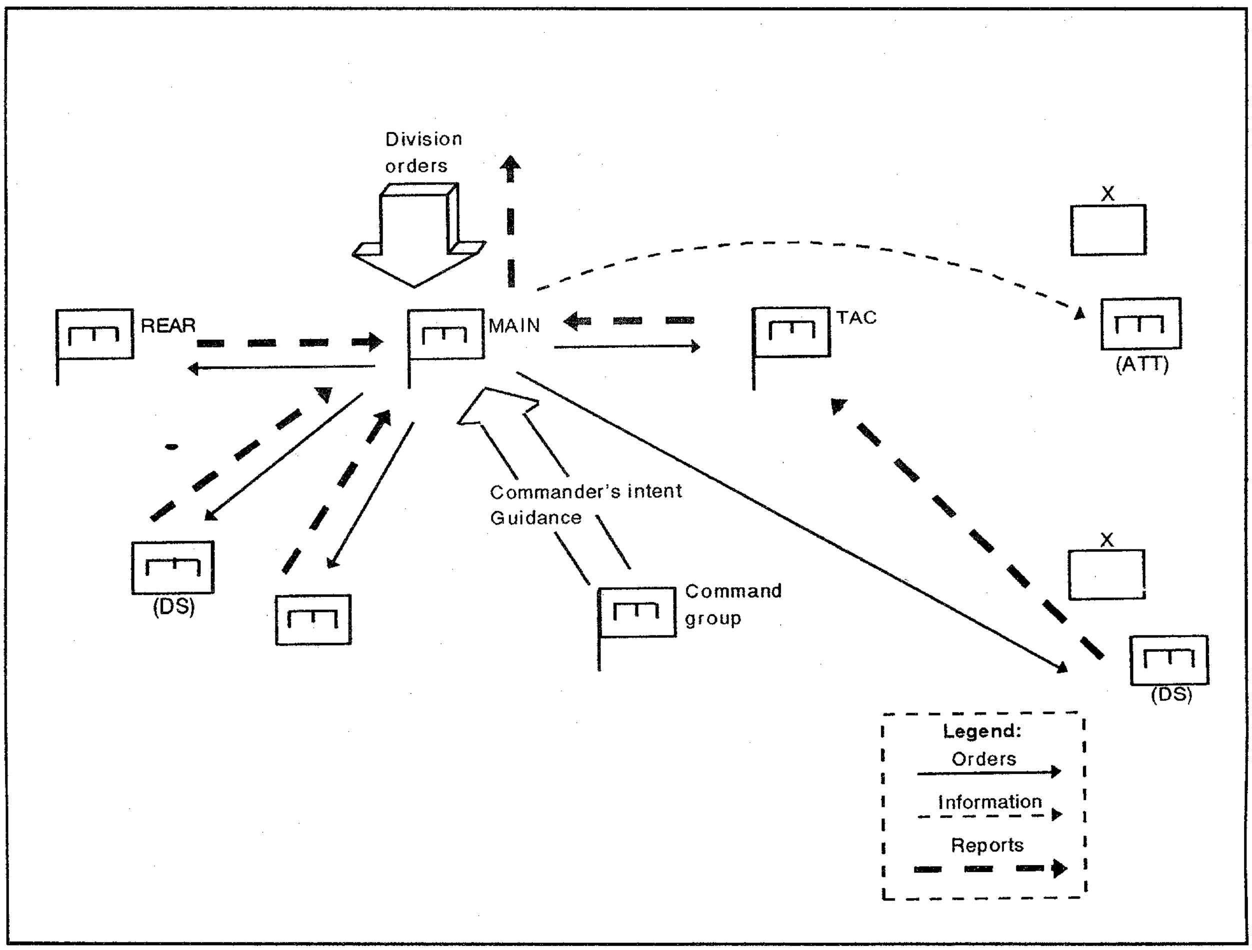

Figure 2-4. Unit C2

ENGINEER PLANNING PROCESS

The MDMP is a proven analytical process that aligns itself with the standard problem-solving process. The MDMP is as detailed or as simple as time permits (Figure 2-5). It helps the commander and his staff reach logical decisions by detailed examination of the battlefield. When used in a deliberate, fully staff-integrated fashion, the MDMP becomes the commander's planning foundation. Products created during the MDMP become the basis for subsequent planning.

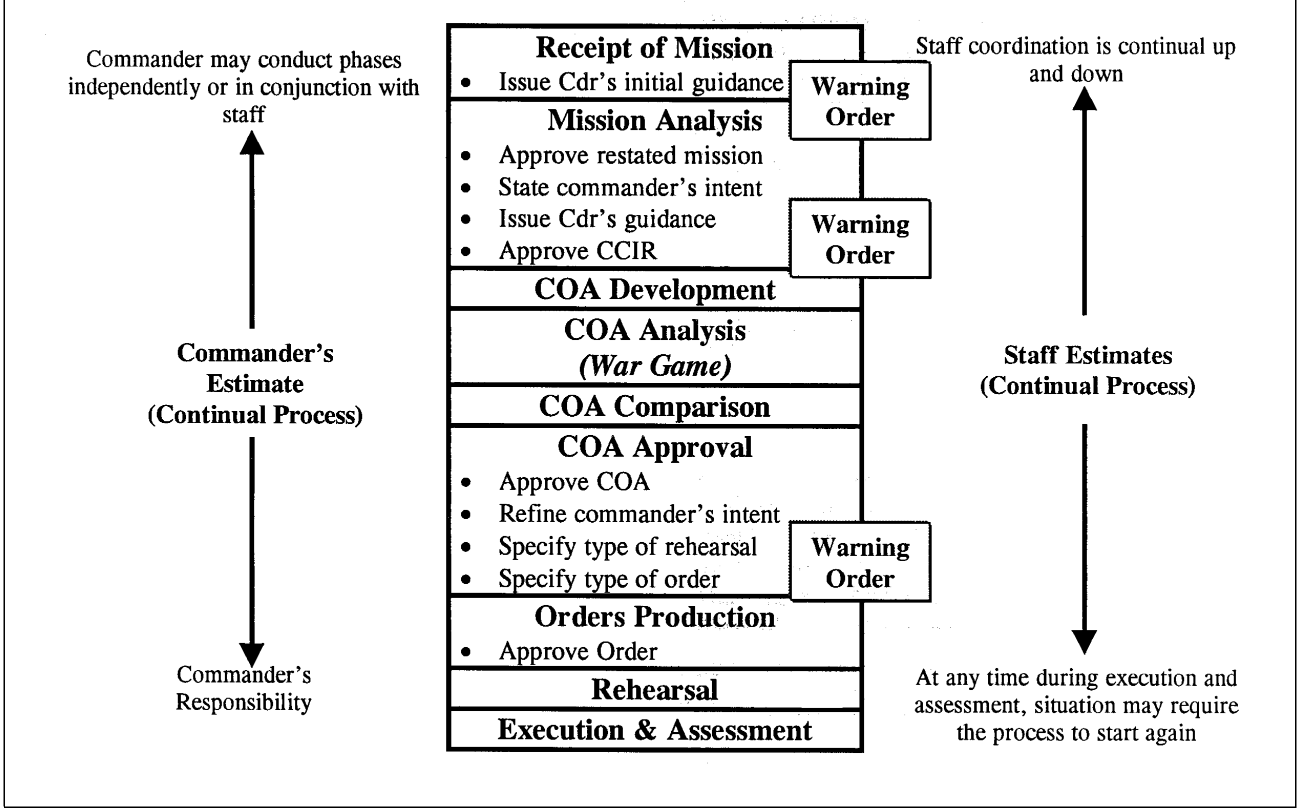

Figure 2-5. Military decision-making process

The engineer estimate process is the primary tool for facilitating engineer planning. The engineer estimate enables early integration of engineer battlefield functions into the division's combined arms plan. The process enables the timely development of necessary engineer instructions to maneuver forces through the division order and to division and supporting corps engineer units through engineer orders.

The nature of engineer support requires integration with the combined arms team beginning at the outset of division planning. The tactical decision-making process is the framework used to focus the efforts of the division commander and his principal staff as they plan and conduct tactical combat operations. The engineer estimate process is simply an engineer extension of the tactical decision-making process.

The steps of the tactical decision-making process and engineer estimates complement one another. Table 2-1 illustrates how the steps of the engineer estimate are an extension of the tactical decision-making process. The arrows show steps which have two-way input and steps where the command estimate dominates the development of engineer plans. The division engineer must understand all aspects of the division plan. In particular, he must thoroughly understand the commander's intent and concept for maneuver, engineers, and fire support. While the engineer estimate process outlines specific steps, it is in no way lockstep. More importantly, it is a continuous process with each step or consideration refined based on changes in the current situation and future mission. Appendix A contains a more detailed discussion of the engineer estimate.

Table 2-1. MDMP and the engineer estimate

Military Decision-Making Process	Engineer Estimate
Receipt of Mission	Receipt of Mission
Mission Analysis •Analyze higher headquarters order •Conduct IPB •Determine specified, implied, and essential tasks •Review available assets •Determine constraints •Identify critical facts and assumptions •Conduct risk assessment •Determine CCIR •Determine reconnaissance annex •Plan use of available time •Write restated mission •Conduct mission analysis briefing •Approve restated mission •Develop commander's intent •Issue commander's guidance •Issue warning order •Review fact and assumptions	Mission Analysis •Analyze the higher headquarters orders - Commander's intent - Mission - Concept of operation - Timeline - Area of operations •Conduct IPB/EBA - Terrain and weather analysis - Enemy mission and M/S capabilities - Friendly mission and M/S capabilities •Analyze the engineer mission - Specified M/S tasks - Implied M/S tasks - Assets available - Limitations - Risk as applied to engineer capabilities - Time analysis - Essential M/S tasks - Restated mission •Conduct risk assessment - Safety - Environment •Determine CCIR (Terrain and mobility restraints, obstacle intelligence, threat engineer capabilities) •Integration of reconnaissance effort
Course of Action Development	Develop Scheme of Engineer Operations •Analyze relative combat power •Engineer missions and allocation of forces/assets •Engineer priority of effort/support •Commander's intent for M/S operations •Employment considerations of engineers •Integration of engineer scheme of operations into maneuver COA
Course of Action Analysis	War-game and Refine the Engineer Plan
Course of Action Comparison	Recommend a COA
Course of Action Approval	Finalize the Engineer Plan
Order Production	Input to Basic OPORD •Scheme of engineer operations •Subunit instructions •Coordinating instructions •Engineer annex/overlay

As a result of the engineer estimate, the division engineer ensures that the necessary engineer missions and instructions are included in the appropriate part of the division order. Engineer information and instructions are not simply consolidated in the engineer annex; this tends to obscure critical information and instructions from the maneuver brigade commanders. For example, if reducing and marking eight breach lanes through a breach head is critical to the division plan, it may appear as a specified task to the breaching brigade. Likewise, the enemy's recent integration of scatterable mines in his preattack fires may be included in the enemy situation of a FRAGO. The scheme of engineer operations is another example of engineer information contained in the base division order. It describes the general concept for engineer support to the division fight, usually concentrating on the close battle. The engineer estimate helps the planner identify critical engineer information and mission-essential tasks for inclusion in the basic order. Table 2-1a, page 2-14, illustrates how key components of the engineer estimate process drive engineer input into the division basic order.

In the FXXI division, the ABCS enhances the overall tactical decision-making process by automating the manner in which information is acquired and shared. The inoperability between the various BOS ABCS enables vertical and horizontal sharing of large volumes of real-time or near-real-time friendly and enemy data, digital graphics, imagery, and other critical planning information. This capability allows each staff element to push or pull information using home pages, client-server interfaces, FTPs, free text messaging, or other approved message formats. This constant flow of information between staff elements expedites parallel planning and quickly fills information gaps. Therefore, the steps performed in the decision-making process may be altered, bypassed, or omitted.

Engineer Annex

At division level, most OPLANs, OPORDs, and detailed FRAGOs will include an engineer annex. The engineer annex conveys critical engineer information and engineer-specific instructions that are either too voluminous or not appropriate for inclusion in the basic order. The annex may take the form of written instructions, matrices, overlays, or a combination. Appendix B discusses the format and content of the engineer

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Table 2-1a. Engineer input into the division OPORD

ENGINEER ESTIMATE	INPUT	OPORD PARAGRAPH
IPB/EBA	Critical aspects of the terrain and enemy engineer activity impacting on the maneuver plan	1. SITUATION a. ENEMY INTEL ANNEX
MISSION ANALYSIS	Mission-essential M/S tasks assigned to maneuver units or separate engineers	3. EXECUTION e. SUBUNIT MISSIONS - MANEUVER - ENGINEER
DEVELOP SCHEME OF ENGINEER OPERATIONS	Concept of engineer operations to support division plan	3. EXECUTION d. SCHEME OF ENGINEER OPERATIONS
	Task organization of engineer forces and command/support relationships	TASK ORGANIZATION
	Allocation of M/S mission resources to maneuver units	4. SERVICE SUPPORT
	Graphic control measures needed for obstacle control, river-crossing, and large-scale breaching operations	OVERLAYS: OPERATIONS ENGINEER CSS
WAR-GAME AND REFINE	Additional coordinating instructions to maneuver units needed to synchronize engineer effort	3. EXECUTION f. COORDINATING INSTRUCTIONS
RECOMMEND COURSE OF ACTION	None	None

CONTINUOUS

FINALIZE ENGINEER PLAN

annex in more detail and provides sample matrices and overlays. Table 2-2 illustrates how the content of the engineer annex is derived from the engineer estimate process.

Orders

All commanders issue timely, clear, and concise orders to give purpose and direction to subordinate planning, preparation, and execution. DIVEN commanders issue orders to all subordinate engineer units, as necessary, to execute the scheme of engineer operations for the division close and rear fights. Orders transform the division scheme of engineer operations into clear, concise engineer missions. They combine the concept of engineer support with the engineer unit-specific plans needed to accomplish engineer missions and sustain the engineer force. In short, they bind the entire engineer plan together and ensure unity of the engineer effort.

The DIVEN commander uses his unit orders to command engineer forces remaining under his control for the fight. These unit orders may prescribe engineer missions in the close and rear battle. However, the bulk of engineer missions in the close battle are conducted by engineers supporting the maneuver brigades and are executed through functional control of the maneuver brigades. These missions may be assigned as tasks in the division order and annexes. Regardless of the command-and-support relationship, the division engineer must still provide the division commander with functional control over the engineer effort within the brigades and battalions to ensure unity of effort.

The DIVEN commander uses the combination of division and engineer unit orders to exercise the appropriate level of command versus engineer functional control. The DIVEN commander exercises a high level of

CHAPTER 3

Offensive Operations

The primary purpose of the offense is to destroy the enemy and his ability and will to resist. Offensive operations are designed to defeat the integrity of the enemy's defense system by driving into his rear and destroying artillery, reserves, C2 systems, CPs, and logistics support. Offensive operations may also be conducted to secure key or decisive terrain, deceive or misdirect uncommitted enemy forces, fix or isolate units, gain information, or spoil an enemy's offensive preparation. Divisions are normally tasked to conduct offensive operations as part of corps offensive or defensive operations. However, a division may conduct an offensive operation independently as a contingency force or internally as part of its own offensive or defensive operation.

Improved navigation, target acquisition, C2, and the introduction of information-sharing capabilities enhance the ability of the FXXI division to conduct sustained offensive operations. FBCB2 and MCS enable engineer elements at brigade and below to use the protection and security afforded by terrain, without loss of orientation or SA. At division level, combat information, including contact reports, SPOTREPs, and revised operational graphics necessary to sustain synchronization throughout the operation, are digitally passed between ABCS in real or near-real time. The cumulative effect of the division's advanced digital capabilities is a more tactically agile and lethal force capable of operating at higher operational tempos than an analog division.

This chapter provides a doctrinal foundation for division engineer support to offensive operations. It serves as an engineer extension of FM 71-100, Chapter 4. It examines how division engineers, regardless of the type of division, fit into the offensive framework and assist the division in achieving successful offensive operations. It also addresses how the DIVEN uses technologically advanced systems and sensors to support the FXXI division offensive operations. Understanding how division engineers fit into the division framework is prerequisite to effective offensive engineer planning. The engineer estimate process remains a useful tool but must be focused to meet the needs of division offensive planning.

While the role of division engineers in the offensive framework and the focus of engineer planning are the same for both armored and light forces, their tactical employment is distinctly different. In short, armored and light divisions fight differently. Each type of division is designed to have specific capabilities on the battlefield; however, each also has inherent limitations. Therefore, each type of division applies the baste forms of maneuver and conducts the five types of offensive operations to maximize the division's capability and minimize its limitations. These tactics are unique to the type of division and demand a corresponding unique employment of division engineers. Moreover, the engineer force structure in armored and light divisions is different, with diversified capabilities and limitations. Therefore, separate sections of this chapter are dedicated to the foundations of engineer employment for armored and light division engineers in support of offensive operations.

OFFENSIVE CHARACTERISTICS

The offensive operation is the division's primary means of gaining and maintaining the initiative. Successful engineer support of the division attack depends on the division engineer's understanding and application of five offensive characteristics: concentration, surprise, speed, flexibility, and audacity. Although the five offensive characteristics have not changed as a result of digitization, FXXI divisions possess the ability to execute these characteristics with greater precision and speed. For example, a FXXI division commander can use organic systems and sensors to acquire information derived from both air (UAV, JSTARS, Rivet Joint) and ground (Raptor ICO, AN-TPQ-37 radar, Improved Remotely Monitored Battlefield Sensor System (IREMBASS)) sensors. This allows the commander to gain an early appreciation for the enemy's location, disposition, and direction of movement. Friendly locations, capabilities, and limitations are shared between the Battlefield Automated System (BAS) and MCS. Concentration, surprise, speed, flexibility, and audacity are all enabled based on enhanced SA and an ability to develop an RCP among all divisional elements by sharing information and operational graphics related to enemy locations, dispositions, and movements.

The information shared also shortens operational planning, and preparation, and it facilitates faster tactical decision-making. For example, the commander can quickly modify his concept of operations and scheme of maneuver based on the real-time and near-real time intelligence received. Using this information, the commander can maneuver his forces at a time and location of his choosing to commence a surprise attack or ambush. The staff digitally prepares and disseminates an OPORD, a FRAGO, or a WARNORD with accompanying digital overlays that addresses the operational changes. The commander and/or staff can use the BVTC white board to conduct rehearsals that enable synchronization and unity of effort. The major subordinate command's (MSCs) will simultaneously receive the revised order via their C2 digital systems (MCS and/or FBCB2). The MSCs can adjust priorities, reorganize rapidly, and initiate movement. Precision movement and maneuver are enabled using the FBCB2 and the EPLRS. Concentration is achieved by massing combat power at the point of attack. The division engineer must task organize and develop a scheme of engineer operations that masses the right type of engineer support at the right place and time and supports the massing of maneuver forces. The engineer task organization must provide the most responsive support at the point of attack.

The division achieves surprise by attacking where the enemy least expects. To give the division the element of surprise, division engineers overcome existing and reinforcing obstacles rapidly and provide the division with mobility over restrictive terrain. Engineer speed and flexibility in support of the division are critical to the attack. Speed and flexibility are required to take advantage of enemy weaknesses, exploit success, and maintain the ability to shift the main effort rapidly. They are achieved by both a responsive engineer C2 system and a responsive decision cycle. Finally, the division engineer facilitates offensive audacity by seeing the battle and anticipating future engineer requirements. He must constantly posture the engineer force so that the division can rapidly take advantage of narrow windows of opportunity.

The commander of a FXXI division will use his digital resources to define the enemy commander's intent and deny the enemy the ability to conduct reconnaissance, surveillance, and intelligence gathering. In the FXXI division, the commander, with the support of engineer mobility systems, has the flexibility required to conduct speedy movement. The division engineer is focused on rapidly overcoming existing and reinforcing obstacles or supporting deep strike operations. The speed with which the DIVEN conducts these mobility operations is key to the critical maintenance of operational tempos. When equipped with advanced engineer systems, such as Grizzly and Wolverine, obstacles can be rapidly breached to maintain the desired operational tempo. Mounted engineer squads may also augment mobility operations. These squads, when equipped with DRS and Raptor ICO sensors, are capable of performing engineer reconnaissance that provides terrain and intelligence information. They can also conduct limited obstacle reduction and lane marking.

DIVISION OFFENSIVE FRAMEWORK

The division engineer must understand the division offensive framework to integrate effectively into offensive operations as both engineer planner and unit commander. In planning and conducting the offense, the division concentrates on the offensive battlefield framework–deep, close, rear, security, and reserve. Division engineer planners, commanders, and units each have a role in these five components. Understanding how division engineers support the division offensive framework is imperative to effective integration.

Deep Operations

The purpose of division deep operations is to create the conditions required for successful close operations. Deep operations are conducted to destroy uncommitted forces that could influence the outcome of the close fight. The division deep battle initially focuses on interdicting enemy division reserves, then shifts to enemy forces defending in subsequent objectives (future fights) as the close operation moves forward. The primary means for conducting division deep operations are field artillery (FA), attack helicopters, battlefield air interdiction (BAI), and EW. However, the division may also use ground-maneuver units or dismounted infantry task organized for air assault operations. The division uses these assets to target enemy artillery, counterattack forces, C2 nodes, ADA, and sustainment operations.

Division engineers contribute to all facets of deep operations as both planners and units. For example, the division engineer may plan for the use of the Gator or air-delivered Volcano as part of a division joint air attack team (JAAT) against enemy reserves or counterattack forces. When the focus of the deep operation is against enemy sustainment activities, the division engineer works with the G2 to identify and nominate enemy engineer logistic sites as priority targets. Division engineer units are task organized to dismounted infantry or ground-maneuver units committed to division deep attacks to provide the force with the necessary engineer support.

Engineer support to deep operations requires aggressively working the intelligence system and synchronizing current deep operations with the future close battle. The division engineer must continuously assess the engineer needs of division deep operations. He works closely with the G2 cell in identifying information requirements needed to plan, resource, and synchronize engineer support to deep operations. The process is continuous. As the close and deep battles move forward, the engineer must continue to refine his intelligence-collection requirements. Likewise, the engineer must analyze how the success or failure of deep engineer operations impacts on the future close operation.

The Division Engineer and Deep Operations

During deep operations, engineer assets and systems are used to assist the division commander in shaping the battlefield. This is accomplished through aerial or ground insertion of engineer sapper teams which emplace Raptor ICO sensors and Hornet munitions on likely avenues of approach. The Raptor ICO serves in an active or passive role, can be controlled from a distant station such as the DMAIN or DTAC, and may be activated on command. Engineer sapper teams may also support the maneuver brigades during reconnaissance and surveillance (R&S) operations, providing information related to enemy HVTs and high-payoff targets (HPTs). The division engineer also supports deep operations through the emplacement of SCATMINEs via ground or aerial means and the development of battle damage assessments (BDAs). For example, DIVEN units may support dismounted infantry or ground-maneuver units during deep attacks by employing Gator, Hornet, or air-delivered Volcano. When equipped with Raptor ICO, Hornet mines can be overwatched and activated from remote locations.

The division engineer works closely with his terrain analysis teams and the G2. He uses this close staff relationship to identify and direct the creation of DTSS products (such as special terrain, map products, and or data sets), needed by the division's commanders and staffs. The engineer provides this direction to focus terrain analysis and operational planning for deep operations. Examples of DTSS topographic support to deep operations include deep battle interdiction analysis, air avenues of approach, and slope analysis. An example of a special terrain product that aids the division commander's visualization of the battle space is the combined obstacle overlay (COO). The COO is used by the division engineer to develop the MCOO.

Close Operations

In the offense, division close operations focus on penetrating a defending regiment, fixing enemy forces adjacent to the main effort, and committing brigades to exploit success. Supporting the close operation is the focus of division engineer effort. In general, division engineers are task organized to mass mobility assets in the lead brigades of the division main effort. Division engineers are also task organized to provide the necessary mobility and countermobility to supporting attacks that must penetrate and fix adjacent enemy forces. Mobility for the exploiting brigades is provided by both corps and division engineers. Corps engineer units upgrade breach lanes for forward passage of exploiting brigades. Division engineers are task organized to the exploiting brigades to maintain mobility support forward.

Deception operations play an important role in the close operation. The division uses deception to target enemy regimental or division commanders, causing them to divert combat power away from the friendly main attack. The division engineer participates in planning deception operations by identifying engineer requirements needed to support the overall deception plan. He must also identify, up front, the impact that committing engineer resources to the deception has on support to the main effort. For example, the division may use a demonstration to cause the enemy commander to position his reserve away from the friendly main effort. The deception picture may not be complete without a supporting show of engineer force. However, the division engineer must consider the impact that dedicating engineer forces to the demonstration has on the main effort.

Close operations normally consist of main and supporting attacks. The main attack seizes the division's primary objective or destroys the division's assigned enemy force. It is characterized by mass concentrations of fire supported by dedicated CS and CSS to make rapid, bold, decisive advances.

The main effort of division engineers is to provide dedicated engineer support to the division main attack. The engineers supporting the main attack must remain focused until the mission is accomplished. The division engineer maintains this focus of engineers with the main effort by tasking them with mission-essential, division-level tasks only. The division engineer uses uncommitted engineers under division control to accomplish other engineer missions. In close operations, the fight is directed and controlled by the attacking brigades using direct and indirect fires and maneuver to defeat defending enemy battalions. Engineers committed to the main attack are normally attached to maneuver brigades for the duration of the mission to give the brigade commander the most responsive support possible.

The supporting attack exists only to assist the main attack. The mission of the supporting attack is limited in scope. It may be to deceive the enemy, seize critical terrain, fix adjacent enemy forces, or prevent enemy disengagement. Although the supporting attack usually receives fewer resources than the main attack, its success or failure may determine the success of the main attack. Therefore, commanders and their staffs must understand the link between main and supporting attacks.

The division engineer cannot ignore the engineer needs of the supporting attack. Again, he must consider how the supporting attack assists the main effort and identify the critical engineer tasks necessary to render that assistance. While the supporting attack is not normally the main effort of engineer support, certain essential engineer missions may receive priority resourcing. For example, the division may task its supporting attack to fix an enemy counterattack force in position before it can be committed against the main effort. Engineers committed to the supporting attack, in this case, may be task organized with the bulk of the division's ground Volcano, taking away some flexibility from the main effort.

Flexibility is a key component of successful close operations. The division develops contingency plans that enable it to shift from one type of offensive mission to another. The division also plans contingencies for shifting forces and the main effort between brigades. Therefore, division engineers must be sensitive to the contingency plans of the division and anticipate engineer requirements. The division engineer should plan for the improvement of routes between brigades to facilitate the lateral shifts in combat power. In addition, he must develop their own contingency plans for shifting critical engineer assets between brigades as the main effort or mission changes.

The division also uses follow-and-support forces to accomplish missions that would otherwise divert forces away from the division main effort. A follow-and-support force is not the same as a reserve. It is a committed force with specific missions and is task organized with appropriate combat, CS, and CSS forces. Some potential follow-and-support missions are to widen or secure a penetration, secure key terrain, open LOCs, control refugees or prisoners, destroy bypassed enemy units, and attack counterattacking forces.

The division engineer must understand the division commander's intent for the use of follow-and-support forces. The division engineer analyzes the engineer tasks inherent in the possible missions assigned to the follow-and-support force and task organizes engineer support accordingly. Depending on his mission analysis, he may allocate organic or supporting corps engineer forces to accomplish follow-and-support engineer missions. Again, he must guard against allocating engineer forces to follow-and-support missions at undue expense to the main effort.

The FXXI division maintains the initiative by preparing contingency plans that facilitate the transition from one type of offensive operation to the next with minimal delays. During this ongoing contingency planning, the division engineer monitors the RCP on his ABCS screens to ensure that engineer support is flexible and responsive to the developing situation. For example, situational awareness is increased with FXXI digital enablers, thus promoting anticipative analysis. Engineers can now better plan sustainment work efforts based on anticipative route degradation and organizational mission changes. Using SA and ongoing digital terrain updates, he anticipates and develops engineer contingency plans (such as massing equipment, reorganizing assets, identifying Raptor ICO/Volcano packages, and integrating analog corps engineer support into FXXI division engineers).

Close operations can consist of both a main and a supporting attack. Using ASAS-RWS, MCS, AFATDS, FAADC2I, and FBCB2, the attacking brigades will direct and control close operations, mass the division direct and indirect fires, to include attack helicopters and tactical air (TACAIR), and conduct maneuver against defending enemy regiments. In close operations, division engineers who are organic to the maneuver brigade provide support to the main effort of the division's lead brigades. This gives the brigade commander the most responsive support possible.

During planning for close operations, the division engineer and the ADE work closely with the G3. This is to ensure that the division engineers are properly task organized and structured to—

- Support the main effort's movement.
- Provide the necessary mobility and countermobility to the supporting attack that must penetrate and fix adjacent enemy forces.

Both corps and division engineers provide the division's mobility support during close operations. With the development of Grizzly and Wolverine, breaching operations can be rapidly accomplished from the protection of armored vehicles with security provided by the direct fires of units assigned overwatch responsibility for the obstacles being cleared. The corps engineer units upgrade breach lanes for forward passage of exploiting brigades. The Raptor ICO may also be used during close operations in conjunction with SCATMINES to protect flanks and/or overwatch likely avenues of approach.

Reconnaissance and Security Operations

Reconnaissance and security operations are essential to the success of division offensive operations. Reconnaissance is used to confirm or deny critical assumptions made about the terrain and enemy situation. Aggressive reconnaissance is critical to identifying and guiding attacking forces to an enemy weakness. The information is useless, however, if it is not rapidly evaluated, interpreted, and disseminated to the attacking brigades.

Engineers assist in reconnaissance in multiple roles. The division engineer must work closely with the division staff to integrate engineer information requirements into the total intelligence-collection effort. While engineer unit participation in combined arms reconnaissance is primarily at the task force level, their efforts are largely focused by the information requirements (IR) and PIR coordinated at division and brigade. The division engineer assists the G2 cell in interpreting and analyzing intelligence. He assists the division commander and his staff in analyzing the impact engineer intelligence has on current and future operations. Engineers must make maximum use of engineer channels to forward combat intelligence to higher headquarters and pass analysis to subordinates.

The purpose of division offensive security operations is to guard against unexpected interference by enemy forces. The division secures its flanks and rear by screen and guard forces. The division engineer assists the G2 in identifying likely mobility corridors and avenues of approach that threaten the division's flanks and rear. He analyzes the threat and makes recommendations on the use of situational obstacles to assist guard and screening forces in its security mission. In addition to obstacle information, the FXXI division engineer identifies likely enemy mobility corridors and avenues of approach that threaten the division's flanks and rear.

Other division elements working closely with the division engineer to provide reconnaissance and security information include—

- G2.
- Division engineer battalions.
- BRTs.
- Longbow Apache (LBA).
- Air cavalry ground and air troops.
- Maneuver brigade scouts.

Engineers within each of the division's MOB cells use the G2 intelligence feeds, which are stored in the engineer ASAS-RWS database and merged with data stored in the DTSS database, to create intelligence products for the commander. This information, coupled with the results obtained through an aggressive and well executed R&S plan, assists the division commander in visualization of the division's battle space. This information also facilitates identification of enemy weaknesses or vulnerabilities that may be exploited.

Additional data that the division terrain management team acquires to complete reconnaissance information is compiled from multiple national and strategic sources in the form of digital map data and or data sets pertaining to specific areas of terrain interest in the division AO. This data is used to conduct and develop an analysis of terrain with ongoing climatology to assess their impact on both friendly and enemy operations. This analysis is critical to R&S, maneuver, and DIVEN operations. For example, the division engineer uses this analysis to make recommendations on the use and emplacement of situational obstacles that support mobility and assist guard and screening forces in their security missions. It also provides critical line-of-sight (LOS) and slope information for communications, fire support (FS), cavalry, and attack-helicopter planners.

FXXI engineer reconnaissance elements utilize ABCS components and special digital tools to record and transfer detailed observations automatically to analysts at their respective CP. The FBCB2 and Land Warrior/DRS provide this reporting capability down to the individual engineer (see Appendix F).

It is imperative that the engineers, G2, and terrain analysts rapidly interpret, fuse, confirm, and disseminate the information critical to maneuver, CS, and CSS units supporting offensive operations. This includes supporting information, such as digital overlays, graphics, and imagery (still and live). ABCS links allow this key information to be immediately disseminated to all division elements affected. This information is normally disseminated via digital means using USMTF, VMF, or dynamic distributed overlays (DDOs).

When FXXI engineer reconnaissance teams accompany forward elements, they will also provide early security and assistance in shaping the future battlefield through the employment of obstacles with acoustical sensors. These security operations are mounted to guard against unexpected interference by enemy forces. Screen or guard forces as well as digital systems, such as the Raptor ICO, may assist in securing the division's flanks.

Reserve Operations

The division creates a reserve force to maintain the momentum of the attack by exploiting success, defeating counterattacks, providing security, or weighting the main effort. The division reserve is not a committed force; it has multiple *be prepared* missions which are executed on the decision of the division commander. The plan does not depend on the commitment of the reserve to accomplish the mission. The size and composition of the reserve are completely METT-T dependent.

The division engineer must understand all of the *be prepared* missions of the division reserve and analyze the engineer tasks involved. In the offense, engineers with the reserves are essential. To exploit success and maintain the tempo of the attack, the division commander must be able to commit his reserve with all CS and CSS intact. The commitment of the reserve must not be delayed by changes in engineer task organization necessary to accomplish its mission. The engineer tasks involved in reserve operations missions are essentially the same as the attacking brigades.

The division engineer must be cognizant and knowledgeable of all aspects of the reserve mission to include *be prepared* missions. The commitment of the reserve must not be delayed by changes in engineer task organization necessary to accomplish its mission. Therefore, the division engineer must remain situationally aware through the division and engineer digital and voice systems. This will enable him to anticipate engineer requirements well ahead of the commander's employment of the reserve. He uses digital systems to enhance his tactical decision making regarding the disposition structure and posture of the reserve engineer force so that,

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when employed, he facilitates or enables operational tempos and the reserve's ability to exploit success.

Rear Operations

Engineers also play an important role in rear operations. The purpose of division rear operations is to retain the division's freedom of maneuver and continuity of operations. Rear operations involve synchronizing and protecting division sustainment operations to support the attacking brigades. Engineers support rear operations by constructing, maintaining, or improving LOCs necessary to sustain the force. In the offense, LOCs may become extended and require rapid changes based on the fluid nature of the attack.

The division engineer, aided by the division rear CP engineer, assists the ADC-S in developing engineer requirements and controlling the engineer units committed to rear operations. The division rear CP engineer, in coordination with the ADE and the division TAC CP engineer, anticipates mission requirements for engineer Class IV/V supplies to be pushed forward to the attacking brigades. Finally, engineers may assist in the development of base camp and base cluster defenses to protect sustainment units from rear area threats. Division engineers are not equipped to handle the diverse, equipment-intensive tasks involved in rear operations. Therefore, corps assets under the division's control are normally tasked with rear area missions.

The rear area operations in the FXXI division are commanded and controlled from the SSOC that is located at the DMAIN. The ADC-S, with assistance from the DISCOM commander, exercises C2 of rear area operations from the SSOC.

The FXXI division engineer manages the engineer rear area operations from the DMAIN MOB cell. He develops engineer requirements and coordinates and controls engineer assets in the DMAIN MOB cell and the sustainment cell with assistance from engineer personnel at these locations.

The Raptor ICO surveillance capabilities and lethal munitions are valuable assets that provide support in rear operations. When used, the employment of Raptor ICO enables the rear area commander to place unmanned combat outposts in key areas and along key routes to protect flanks and LOCs that are vulnerable to enemy attacks.

DIVISION OFFENSIVE FORMS OF MANEUVER

Divisions use three basic forms of maneuver in conducting offensive operations: envelopment, penetration, and frontal attack. The division commander determines which form of maneuver to use based on his METT-T analysis. He uses the form of maneuver as an expression of intent and overall concept of the operation that gives focus to division planning. It is imperative that the division engineer understand each form of maneuver and its implications in developing the scheme of engineer operations and task organization. Two other forms of offensive maneuver are the double envelopment and the turning movement. These forms of maneuver normally require forces beyond the scope of the division and are more applicable to corps operations.

Envelopment

In the envelopment, the division uses a supporting attack to hold the enemy in position while the main effort passes around the main defense and attacks a flank (Figure 3-1). The objective of the main attack can be either force or terrain oriented. The main attack may be used to attack and roll up enemy forces in the main defensive belt, second-echelon defense, or reserves. When the objective is terrain oriented, the main attack is normally focused on securing key terrain which cuts the enemy's LOCs or escape routes.

The mission and nature of supporting and enveloping forces provide the division engineer with some unique challenges in developing a scheme of engineer operations. The engineer main effort must be initially directed to the mobility of the enveloping force and protection of its extended flanks. The brigades and task forces that make up the enveloping force normally organize for in-stride breaching operations because once committed, they must have the capability to breach unforeseen obstacles quickly with minimal delay and maneuver. The division engineer must develop an engineer task organization that facilitates organization for task force in-stride breaches. Engineer task organization must provide for both flexibility and redundancy; the main effort cannot afford to wait for low-density equipment to be brought forward or replaced.

Another important aspect of providing mobility to the main effort is maintaining the enveloping force's LOCs. In the envelopment, the LOC for the main effort can quickly become extended, shifted in response to the attack, or threatened by bypassed units. A division envelopment may require an engineer force dedicated to constructing,

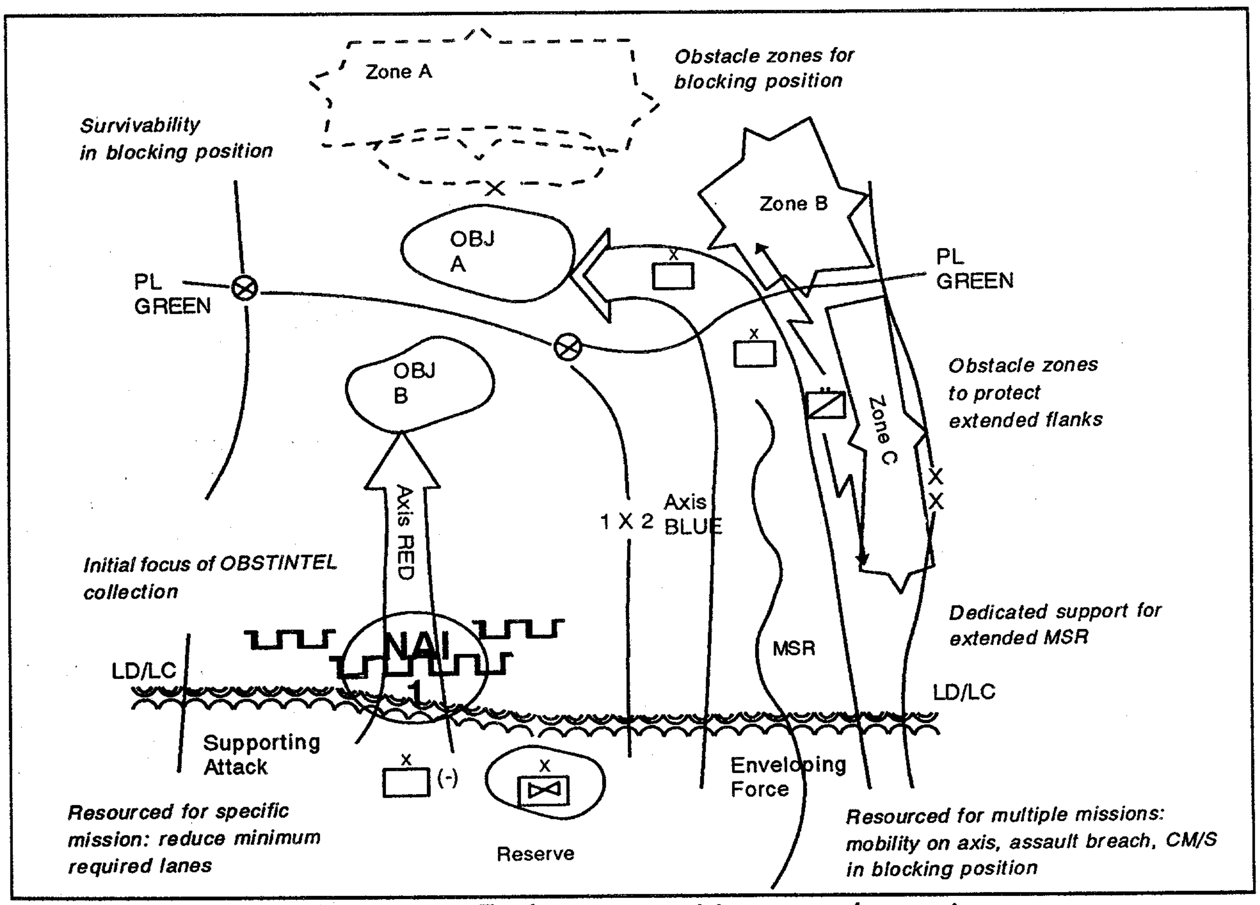

Figure 3-1. Engineer support to an envelopment

exploiting its success by ensuring the mobility of the exploiting brigades. The division engineer uses two mechanisms to support the exploitation. First, the scheme of engineer operations must allow for the rapid development of a lane network within the penetration. The lane network must support both the uninterrupted forward passage of the division reserve to subsequent objectives and the flow of sustainment to forces in the penetration. The division engineer constitutes an engineer follow-and-support force, made of corps assets, to establish, improve, and maintain the lane network. Chapter 5 discusses engineer considerations for large-scale breaching operations in more detail. Second, the division engineer must ensure that the reserve has the engineer task organization necessary to maintain its own mobility as it attacks deep in the enemy's rear area.

During FXXI penetration operations, the division engineer exercises coordination and control over engineer operations from the DTAC CIC. This facilitates direct communication with the ADC-M, G3, and MOB cell. The division engineer maintains communications with the division commander and MOB cell at the DMAIN through digital and voice systems.

The division engineer will task organize and allocate the assets needed to support the missions of the main, supporting, and follow-and-support forces. Engineer task organization recommendations made to the G3 should ensure that the mobility and countermobility needs of the supported commanders meet rapid force projection requirements. The divisional engineer’s responsibility for ensuring routes allows freedom of maneuver for the commitment of reserve and exploitation forces. The division engineer will use enemy obstacle information obtained from sources such as the UAV, SOF, Land Warrior, long-range acquisition scout sensor suite (LRAS3), and Hunter Sensor Surrogate System (HS3) to ensure that the appropriate engineer assets are allocated to breach and clear obstacles at the point of penetration. As obstacle information is received, the division engineer analyzes the data and determines if any additional engineer assets are required to support the division's obstacle reduction requirements. Using this continuously updated information, he is able to accurately coordinate the relocation of EAD engineer support to the division's engineer battalions that are supporting the attacking brigades.

The division normally uses follow-and-support forces to secure the lodgment and defeat counterattacks. Therefore, the division engineer anticipates the size of likely counterattack forces, analyzes likely avenues of approach, and allocates the countermobility assets needed to disrupt or fix counterattack forces. He must plan obstacle zones that permit the use of tactical and situational obstacles. For example, forces securing the lodgment require flexible and responsive obstacle capability. Therefore, the division engineer may use a combination of ground-, air-, or artillery-delivered SCATMINES and, the Raptor ICO when available to enhance flexibility and responsiveness. Obstacle zones are normally developed and passed to the brigades for planning purposes but are only activated on order of the division.

Frontal Attack

The division uses a frontal attack to overrun, destroy, or capture a weaker enemy force in position. A division may employ a frontal attack as part of the supporting attack of a corps envelopment. It is the least desirable form of maneuver because it does not easily facilitate massing overwhelming combat power against an enemy weakness or assailable flank. In the frontal attack, the division strikes along the enemy's entire front with two or more brigades abreast attacking in the zone (Figure 3-3, page 3-10). It is only favored when the enemy is weak or disorganized, the situation is not fully developed, the situation requires immediate reaction to enemy action, or the division mission is to fix the enemy in position.

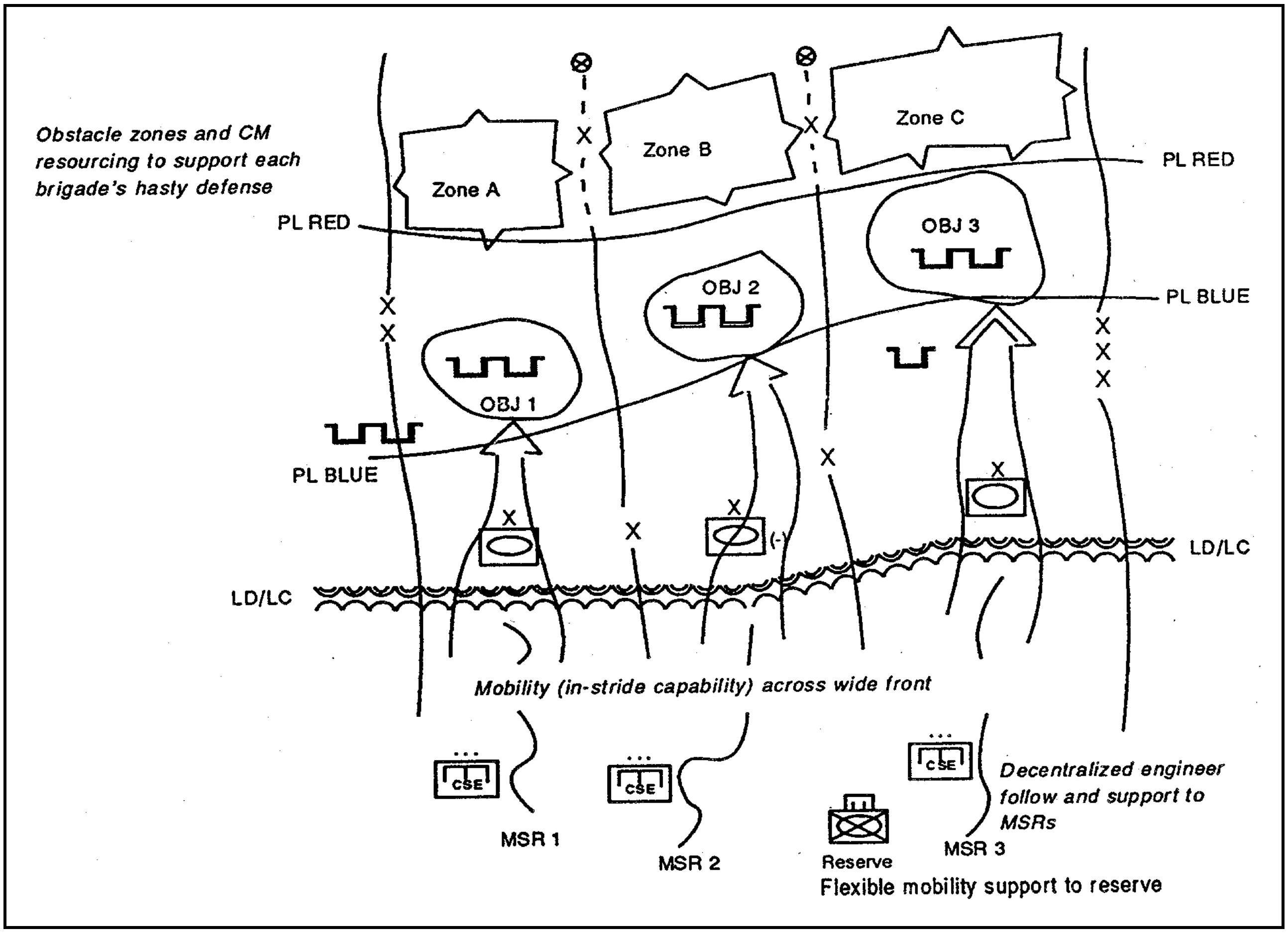

Figure 3-3. Engineer support to a frontal attack

The challenge to the division engineer in supporting the frontal attack is to provide adequate mobility support across a wide front on multiple axes. The nature of the mission may prevent massing overwhelming mobility support from the division perspective. However, the division engineer must ensure that the engineer task organization allows attacking brigades and task forces to mass engineers as required at their level. Quickly attacking a weak or disorganized enemy with the situation relatively unclear demands in-stride breaching capability at the brigade and possibly task force levels. Therefore, the division engineer balances organic and supporting engineers in each attacking brigade instead of in any one brigade.

The division engineer again uses corps assets as an engineer follow-and-support force. The mission of the engineer follow-and-support force is to upgrade breaching lanes and construct or improve MSRs. The decentralized nature of the frontal attack also requires a follow-and-support force capable of decentralized operations. Division engineers with the brigades reduce the lanes necessary to seize brigade objectives. Therefore, corps engineer efforts to upgrade lanes in each brigade zone of attack focuses on passing sustainment traffic rather than combat power. MSR requirements are also decentralized to sustain multiple axes. A corps CSE company, for example, may allocate one of its three CSE platoons to each brigade MSR.

Finally, the division engineer must consider the needs of each brigade to establish a hasty defense on its objective. Again, with brigades attacking in zones, each will normally consolidate on separate objectives and establish distinct hasty defensive positions. The division engineer must be sensitive to the decentralized nature of the division hasty defense. He must ensure that each brigade has the assets necessary for immediate and responsive obstacle and survivability support. If the division plan is to establish a deliberate defense immediately upon consolidation, the division engineer must consider task organizing corps assets to each brigade from the outset of the attack. Additionally, he plans for and coordinates with the G4 to preposition and push necessary Class IV/V (mines) supplies to the brigades.

ENGINEER OFFENSIVE PLANNING

This section focuses on planning engineer support for offensive missions. The engineer estimate provides the planning framework for the division engineer to integrate into the division’s command estimate process. It provides a systematic procedure for developing operation to support the division in offensive operations. The basic estimate process is found in Appendix A.

The engineer estimate and offensive planning process begins with the division engineer receiving this mission. This mission is extracted from the corps OPORD, the engineer annex, graphics, and the division’s WARNORD. Based on the identified mission, the division engineer supports the division mission analysis process in the development of facts and assumptions. Working simultaneously with the G-2, and G-3 he conducts the EAB. The EAB consists of analyzing the terrain and assessing the enemy and friendly engineer capability.

The terrain analysis is conducted in conjunction with the G-2, using the observation and fields of fire, cover and concealment, obstacles, key terrain, avenues of approach, (OKOKA) framework. The terrain analysis is then used to develop the enemy situation template and the corresponding friendly scheme of maneuver. For the offense, the terrain analysis focuses on identifying where the division can move while conducting its offensive operation, and where the division is vulnerable to flank attack and enemy counterattack.

The division engineer works with the G2 in identifying the engineer capability of both the enemy maneuver and engineer forces. Based on the knowledge of how the enemy engineers support defensive operations and the specific enemy capability to conduct engineer operations, the division engineer plots enemy obstacles and the estimated survivability status on the situation template. Based on the situation template, he develops specific enemy engineer intelligence requirements and nominates NAI to incorporate into the division's reconnaissance plan.

Working with the G3, the division engineer analyzes the friendly engineer capability based on the current organic and corps assets available in both the engineer and maneuver organizations. To do this, he accounts for all available and mission-capable engineer assets that will support the division. Additionally, he accounts for other division mobility assets, such as mine plows and rollers.

The division engineer continues the mission analysis by conducting a complete review of the higher command’s OPLAN or OPORD, including operational graphics. The division engineer focuses on the identification of specified and implied tasks, additional engineer assets available in the task organization, the specified acceptable risk, and the time available to conduct the mission. Based on this analysis, the division engineer determines what engineer tasks are essential to the mission and provides this information to the G3 for inclusion in the restated mission.

Following the development and approval of the restated mission, the division commander issues his guidance and intent. The division engineer must identify the form of maneuver and the type of attack the division will employ from the division commander’s guidance and intent. Based on this, the division engineer confirms specified, implied, and essential engineer tasks and prepares to support course-of-action development.

Based on each course of action, the division engineer looks two levels down at maneuver task forces and develops a scheme of engineer operations, focusing on essential engineer tasks. He focuses on mobility support first. Using the division commander’s intent, the terrain analysis, and the situation template, the division engineer identifies the required mobility tasks and the engineer assets needed to perform them. Next, he looks at countermobility tasks, including those required to provide flank and rear security during movement and those required to support hasty defenses on the objective. He identifies the assets required to accomplish those missions and he conducts the same analysis for survivability and sustainment engineering missions.

Having identified the tasks and assets required for a course of action, the division engineer establishes where the engineer main effort must be. He then reviews the engineer and maneuver assets available, allocates engineer assets and recommends the allocation of maneuver assets to accomplish the tasks, and identifies shortfalls in assets. If shortfalls exist, he reviews the allocation of resources to confirm the shortfall. Upon verification of the shortfall, he requests additional assets from corps through the G3. If additional assets are not available, the division engineer focuses on main effort tasks and reallocates assets to compensate for the shortfall. Critical to this process is identifying the risk associated with the shortage of engineer forces and addressing the risk during war gaming and course-of-action comparison.

Having allocated assets to accomplish engineer tasks, the division engineer focuses on C2. Using the habitual relationship C2 structure, he ensures that the assets assigned to each headquarters do not exceed their span-of-control capability. If a shortfall exists, he analyzes all available C2 headquarters and upgrades the C2 structure, if feasible, or identifies, analyzes, and communicates the risk of not increasing the C2 during war gaming and course-of-action comparison. For offensive missions, he weighs the specific engineer mission requirements and communications of organic and corps engineer C2 headquarters.

Once courses of action have been war-gamed, compared, and recommended, the division commander decides how the offensive mission will be conducted and gives his intent and concept of the operation. Based on this, the division engineer refines the division's engineer missions and develops a scheme of engineer operations for inclusion in the execution paragraph of the division's basic OPLAN or OPORD, focusing on total integration into the division's scheme of maneuver. To accomplish these tasks, the division engineer finalizes the engineer task organization and command/support relationships, assigns engineer tasks to the division's subordinate units in subunit and coordinating instructions, provides engineer - specific input into the service-and-support paragraph, and develops the engineer annex. He then briefs the division's engineer plan to the brigade commanders at the division OPORD.

Simultaneously, the DIVEN engineer staff develops the engineer OPLAN and OPORD. It ensures complete dissemination to all engineer units working for the division. Chapter 2 deals more specifically with this process. Finally, the division engineer closely monitors the preparation and execution of the mission, refining the plan as necessary based on the situation. He must maintain continuous liaison with other command and staff organizations to ensure the synchronization of engineer actions within the scope of the division plan.

NOTE: The ability to gather and share large amounts of predictive intelligence via digital systems greatly enhances the war-gaming and COA developmental process. The division engineer may be able to speed the war-gaming process based on a continuous feed of near-time or near-real-time information relative to enemy engineer locations, movements, and dispositions.

OFFENSIVE OPERATIONS: ARMORED DIVISION

Armored divisions conduct five types of offensive operations. They are–

1. Movement to contact (MTC).
2. Hasty attack (HATK).
3. Deliberate attack (DATK).
4. Exploitation.
5. Pursuit.

FM 71-100 contains a description of each type of offensive operation. Understanding the principles and organization of each operation is key to the division engineer providing appropriate planning and engineer force allocation to support offensive operations.

Movement to Contact

The FXXI division can establish contact at far greater distances than previously possible. This preserves the majority of the division's combat power and allows the commander to employ his combat power at a point and time of his choosing. This form of contact is different from the traditional meaning of contact (for example, sights on a target) because contact has been made using digital systems that have an eyes-on capability. Once contact is established, the commander of a FXXI division will use all of his organic digital resources and those of the corps to maintain contact, determine enemy dispositions and locations, and monitor enemy movement. The division conducts a MTC to gain or regain contact with the enemy, limiting the risk to the smallest possible part of the force. The primary consideration in preparing for a MTC is anticipating actions during movement and requirements for maneuver and fire support when contact is made. An armored division MTC is normally organized with a covering force, an advance guard, a main body, and flank and rear security elements.

A MTC has several possible outcomes. First, a division may not make contact with the enemy and reach its objective unopposed. This action could result in continuing the MTC to a subsequent objective or establishing a hasty defense oriented around key

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and fire-support forces that will cover the obstacle to gain the combat multiplying effect.

The main body in a MTC is organized and deployed with the capability to conduct HATKs, hasty defenses, or both. Engineers supporting the main body focus primarily on mobility and countermobility operations. Limited survivability support may be required. Mobility missions include in-stride breaching operations at the brigade or battalion level. The brigades and battalions must also have the capability to transition to a deliberate breach. Therefore, brigades and battalions must have the forces necessary to create a strong mobility reserve at task force and brigade level.

Countermobility operations support to the main body centers around supporting a hasty defense. The hasty defense may be conducted on the objective, as a contingency based on mission analysis, or as a reaction to the tactical situation during the MTC. The division engineer must plan to support all of these possibilities. Understanding all contingencies is essential. Engineer forces are task organized within the main body to give each brigade the flexibility to conduct hasty defenses, to fix enemy forces, or to protect flanks.

Limited survivability requirements are directed or identified through the mission-analysis process. These requirements include providing protective positions for C2 nodes, ADA, or critical fighting positions. Time normally prohibits these operations.

The division engineer plans to support hasty defense operations on the objective by planning obstacle zones and resourcing them based on envisioning the obstacle belts they contain. He ensures that the coordination necessary to deliver the obstacle material is conducted with the DISCOM. Other details, such as emplacement time, lanes, and duration of scatterable mines, must be considered to facilitate future operations. Activation of the obstacle zones and belts is held as an *on order* mission, pending the decision of what and when the next mission for the division will be.

Contingency hasty defensive operations are developed based on the terrain and the size and location of both the friendly and enemy forces. A commander may elect to execute a hasty defense on favorable terrain, based on the action of the enemy and clearly defined PIR and execution criteria. The division engineer plans to support contingency hasty defensive missions like a planned hasty defense on the objective.

The division, or a portion of it, may receive FRAGOs to conduct hasty defensive operations based on the tactical situation. As a response to the FRAGO, the division engineer and division engineer battalion planners immediately designate obstacle zones and belts to support the hasty defense. Time will normally be limited in this type of operation, and countermobility support will normally be in the form of scatterable mines. The division engineer and division engineer battalion planners must identify the countermobility resources available, allocate the resources, coordinate the delivery and emplacement of mission-required push packages, and monitor the emplacement status. Figure 3-5, page 3-16, shows a possible engineer force laydown to support the engineer missions of the component forces in a MTC.

Hasty Attack

NOTE: A HATK may not be required when operating with digital C2 and information gathering systems. The FXXI division commander uses national, strategic, and tactical resources to accomplish early identification, accomplish disposition, and subsequently track enemy forces. His use of SA of the enemy and terrain enables him to accomplish a DATK versus a HATK.

A HATK is an offensive operation for which the unit has not made extensive preparations. A division conducts a HATK with the resources immediately available in order to maintain momentum or to take advantage of the enemy situation. A HATK may be conducted in a number of situations. These include conducting the HATK as a planned contingency during a MTC or as an unforeseen contingency during hasty or deliberate defenses and DATKs.

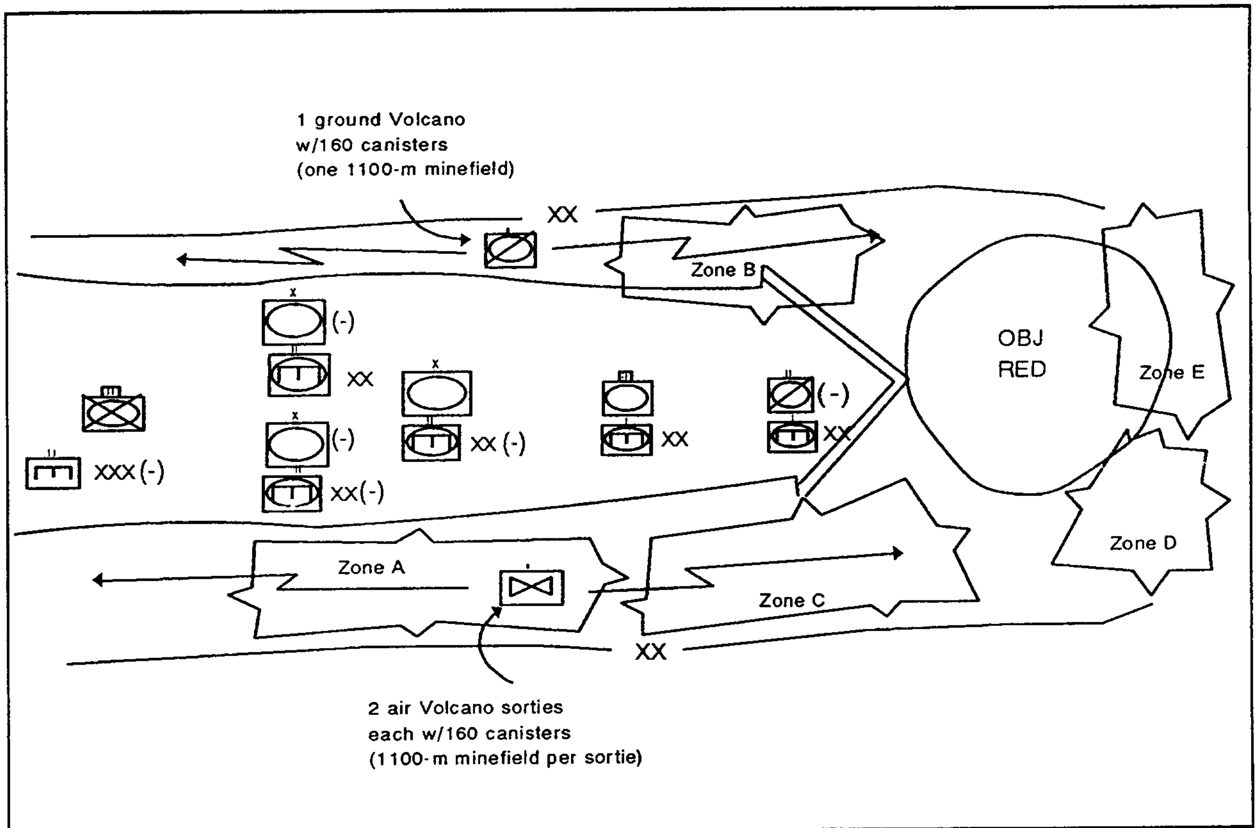

Figure 3-5. Engineer force laydown for a MTC: armored

Mobility support to the HATK is the division engineer's initial concern. He focuses on maintaining the attacking force's freedom of maneuver. Countermobility support is also planned; the focus is on isolating the battlefield and protecting flanks during the attack. Countermobility and survivability support becomes priority when the objective is seized to assist the division in securing the objective and repelling enemy counterattacks. The division engineer plans to support HATKs by identifying engineer tasks during the mission-analysis process and allocating forces to accomplish those tasks.

The division engineer must also consider the sustainment engineering tasks necessary to exploit the success of the HATK. While these missions are not necessarily part of the HATK, they may become critical to exploiting success. For example, a HATK against a disorganized enemy may quickly evolve into a pursuit. Maintaining the momentum of the attack may quickly become a function of the division's ability to sustain the force. An engineer priority at this point is improvement and maintenance of MSRs. Therefore, the division engineer considers sustainment tasks that may evolve as a result of the HATK and pre-position the forces and resources necessary.

HATKs are always a planned contingency in a MTC. Figure 3-6 shows a division conducting a HATK on a moving force from a MTC and the inherent engineer tasks. The division engineer plans to support this mission by developing a decentralized and flexible engineer task organization to support the division's subordinate units. The nature of a MTC requires each maneuver brigade to be task organized with engineer units and have the capability to conduct engineer operations. Since there is no time

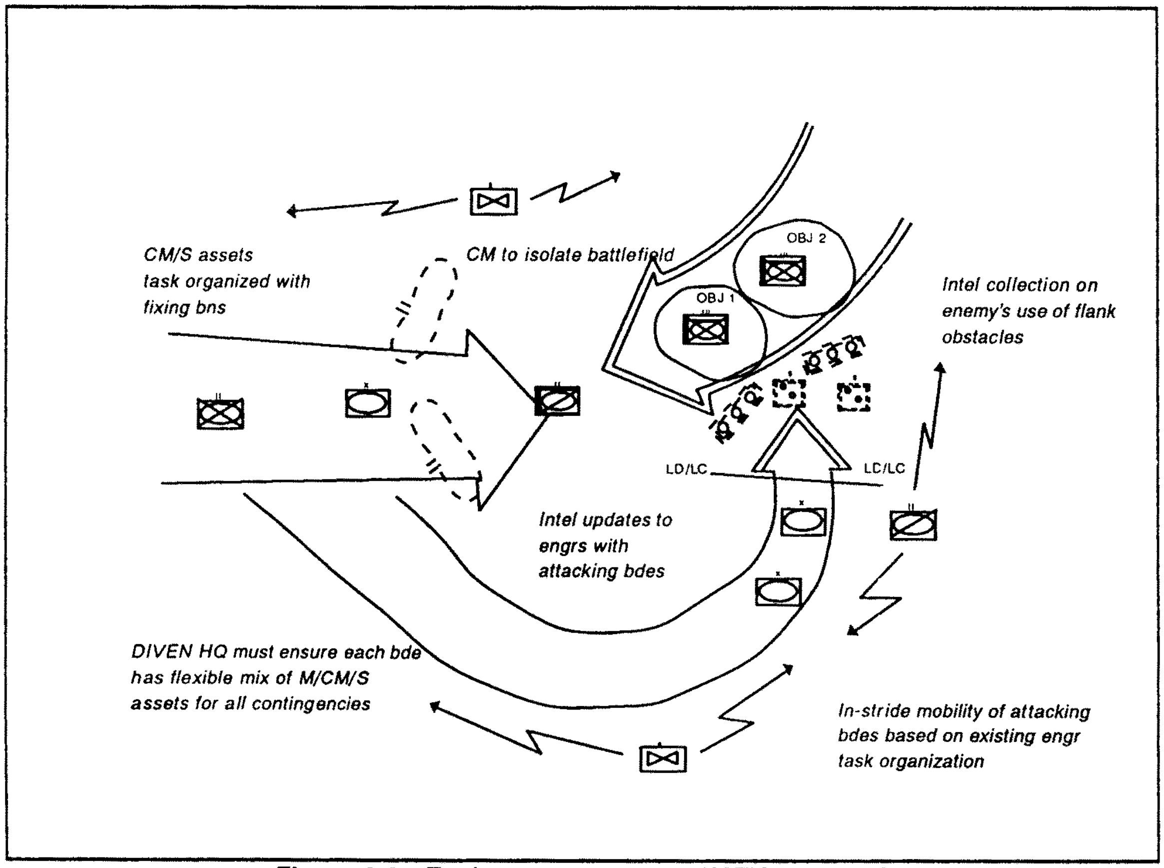

Figure 3-6. Engineer support to a HATK: armored

to shift assets, engineer support to the HATK is based on the existing task organization. Figure 3-7, page 3-17a, shows a division conducting a HATK on a moving force from a MTC and the engineer task organization that supports the division's engineer tasks.

During the execution of the MTC, the division engineer closely monitors the battlefield. The disposition and activities of both friendly and enemy forces are of primary concern when transitioning to a HATK, and critical information is forwarded directly to subordinate engineer units. The division engineer also focuses on coordinating engineer operations between adjacent units during the HATK.

HATKs, in conjunction with a hasty or deliberate defense or a DATK, are normally driven by unforeseen battlefield circumstances and are executed as unplanned contingencies. They occur to defeat unexpectedly encountered enemy forces, as spoiling attacks against unexpected enemy offensive operations, or to counter enemy penetrations. These situations have several common threads. First, the HATK will probably be executed by the reserve force. Second, they occur very rapidly, with little or no planning and preparation time. Third, the division engineer has little impact during the execution of the HATK. His responsibility to supporting these missions revolves around planning and tailoring a flexible engineer task organization before the battle to support the reserve force. Additionally, he monitors the battlefield and directly passes essential intelligence to subordinate engineer units and coordinates the activities of engineers between adjacent units.

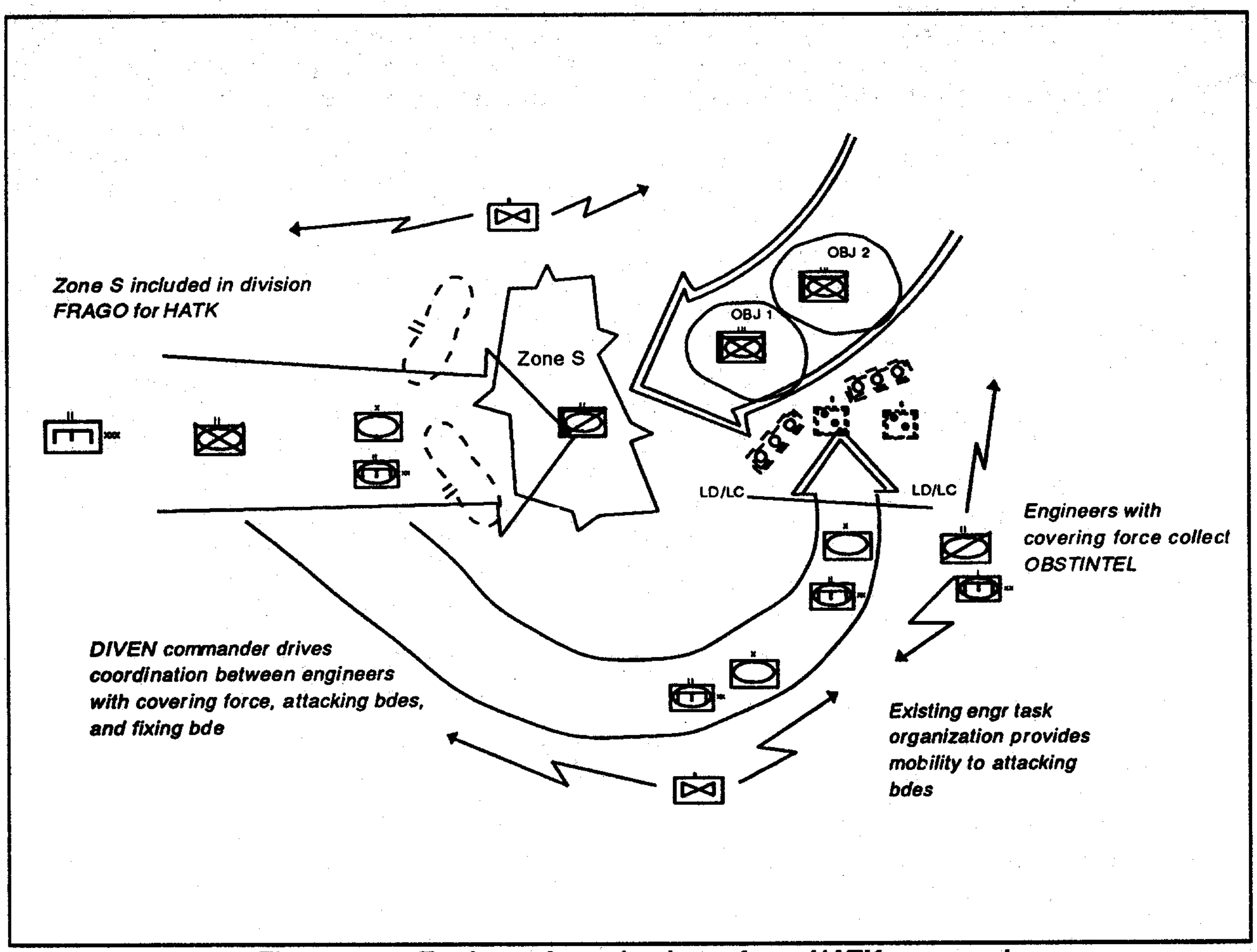

Figure 3-7. Engineer force laydown for a HATK: armored

In the event a HATK is performed, the FXXI division engineer, with his enhanced ability to monitor the tactical situation in real- or near-real-time terms and his knowledge of the terrain, is better able to anticipate and plan for the mobility needs of the HATK force. Through terrain analysis and review of intelligence stored in the ASAS-RWS database, he pinpoints likely avenues of approach into the flanks of the HATK force and projects countermobility operations that will deny use of these approaches. The division engineer is also accountable for survivability and/or force protection tasks if the HATK force is assigned a mission to seize and hold an objective. In this instance, engineer requirements include improving or constructing protective or battle positions and employing obstacles to defend against counterattack. The use of Raptor ICO and SCATMINES enables the division engineer to quickly emplace situation obstacles. Figure 3-7 depicts a division task force conducting a HATK on a moving force and the supporting engineer task organization.

The FXXI division engineer uses both voice and digital systems to closely monitor the ongoing tactical situation. Close attention is paid to the actions of friendly and enemy forces during a HATK to provide an early forecast of potential or emerging engineer support requirements. Coordination and control of engineer activities is accomplished using voice and MCS-ENG.

Deliberate Attack

A DATK is an attack that is planned and carefully coordinated with all concerned elements. A DATK is based on thorough reconnaissance, evaluation of all intelligence and relative force ratios, analysis of various courses of action, and other factors affecting the situation. A DATK is expensive in terms of manpower, equipment, and. supplies. It is generally conducted against a well-organized defense when a HATK is not possible or has been conducted and failed. This type of attack requires massed combat power on a narrow front in an area where there is a high probability of surprise.

The division engineer develops a scheme of engineer operations that focuses on providing mobility support throughout the depth of the division attack. While mobility to initially the main effort. the division engineer also carefully considers countermobility operations. He must plan for the use of situational obstacles to assist in isolating the point of penetration from reinforcement and counterattack and provide supporting protection for the division flanks during the attack. He also develops countermobility and survivability plans for hasty defensive operations to assist in securing the objective once it is seized. Figure 3-8 shows the engineer missions inherent to a DATK.

Providing the necessary mobility support to the division's maneuver brigades is the division engineer's first priority In offensive planning. The allocation of engineer forces is based on the IPB/EBA and the mission analysis conducted during the command estimate. The division engineer must thoroughly understand the division commander's intent and scheme of maneuver, anticipate how the maneuver brigades will fight, and comprehend the threat situational template in order to properly conduct the engineer-mission analysis. The division engineer then looks at the task force level and identifies the number of lanes required for each of the maneuver brigade's task forces. He then compares the

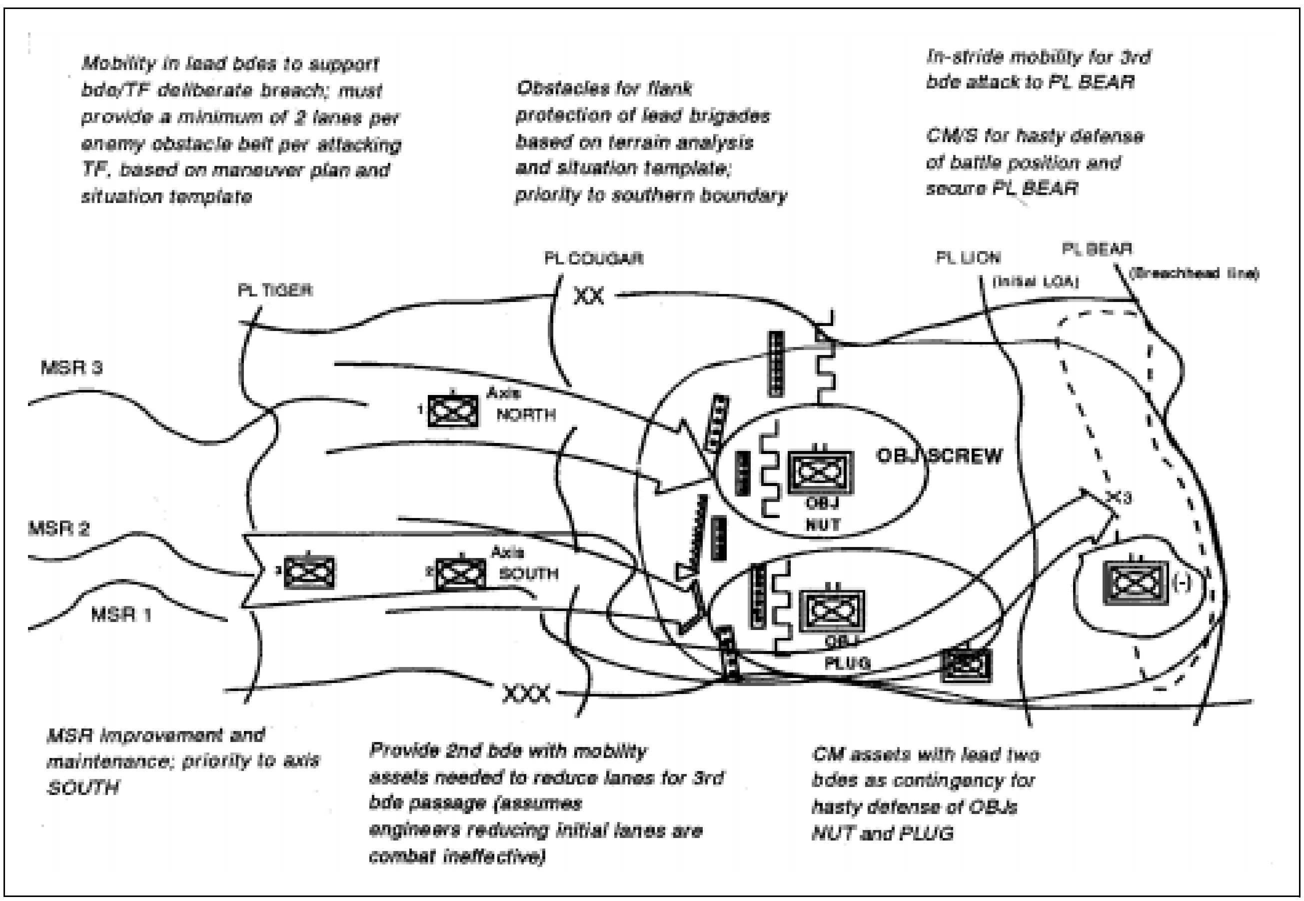

Figure 3-8. Engineer support to a DATK: armored

capabilities of the habitually related division engineer companies to the numbers of required lanes. If a shortfall exists, he allocates additional corps mechanized engineer units to the appropriate division engineer battalion. He then ensures that the existing engineer headquarters is sufficient to command and control the allocated forces.

Countermobility and survivability operations are also significant in supporting a DATK. Countermobility operations assist in isolating the battlefield and protecting the attacking force from enemy flank attack and counterattack. Again, the division engineer must understand the division commander's intent and must thoroughly understand all follow-on missions and contingency plans and allocate engineer forces to support them. This is accomplished through appropriate allocation of engineer assets to provide a flexible engineer force to maneuver brigades.

Using the division's event template, the division engineer estimates the time available to conduct countermobility operations, including transporting obstacle materials to the designated locations, emplacing obstacles, and coordinating fires needed to obtain synergism. He must also coordinate with the DISCOM to ensure that push packages of mission-required Class IV/V supplies and the transportation assets required to haul them are planned and executed to support a hasty defense on the objective. He can influence countermobility operations during the execution of a DATK by accurately tracking the battle and advising the division commander on the use of scatterable mines and by assisting in deconflicting the division's priorities for their use.

The division engineer supports survivability operations be ensuring that maneuver brigades have sufficient blade assets in their engineer task organization. Survivability missions that support DATKs are based on the maneuver brigade commander's priorities and the survivability available in his task organization. Figure 3-9 shows a division conducting a DATK and the engineer task organization that supports the division's engineer tasks.

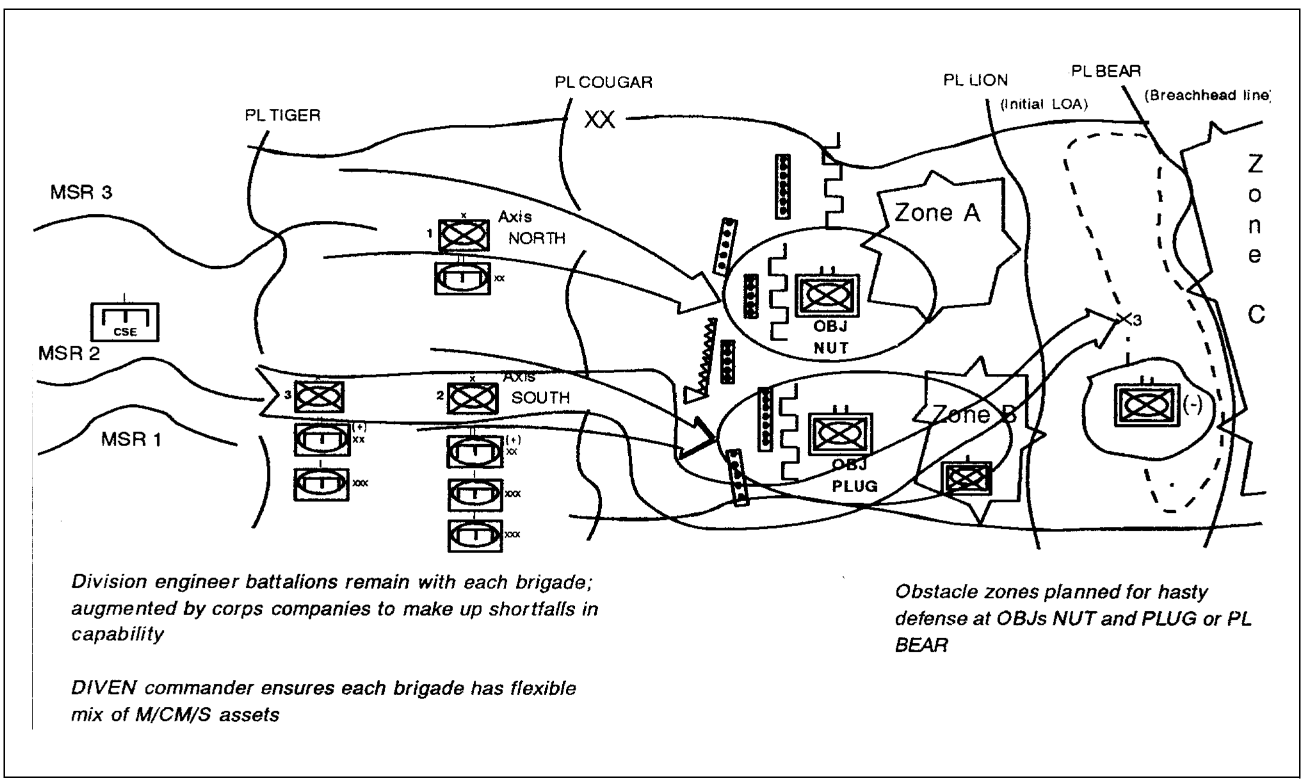

Figure 3-9. Engineer force laydown for a DATK: armored

Exploitation

An exploitation is an offensive maneuver that usually follows a successful HATK or DATK. An exploitation takes advantage of a weakened or collapsed enemy. The purpose of an exploitation is to prevent reconstitution of enemy defenses, prevent enemy withdrawal, and secure deep objectives. An exploitation is normally initiated by already-committed units using available forces to form both an exploiting force and a follow-and-support force. An exploitation is characterized by decentralized execution. The employment of forces is similar to a MTC. The division can either exploit its own success or act as the exploiting or follow-and-support force of a higher unit. Potential missions for the exploiting force are securing objectives deep in the enemy rear, securing LOCs, surrounding and destroying enemy forces, denying escape routes to an encircled force, and destroying enemy reserves.

Based on these missions, the exploiting force requires engineer support. Mobility operations are required to maintain the momentum of the exploiting force so that it can rapidly execute its mission. Countermobility operations are required to secure objectives, block enemy forces, and provide flank protection for the exploiting force. Survivability operations are conducted to protect the force with the mission to secure terrain or deny escape routes.

The follow-and-support force initially prevents the enemy from closing the gap in a penetration and secures key terrain gained during the penetration or envelopment. As the exploiting force advances, the follow-and-support force secures LOCs, mops up or destroys bypassed forces, expands the area of exploitation from the axis of advance of the exploiting force, and blocks the advance of reinforcements into the area. Again, the follow-and-support force requires engineer support to accomplish these missions for the same reasons as the exploiting force. Sustainment engineering missions may also be required to keep LOCs and routes open for exploitation forces and sustainment assets.

The engineer force supports an exploitation in similar fashion to a MTC. The major difference is the very limited time available to plan and prepare for the exploitation. Based on the limited plan and preparation time, the engineer force that supports the exploitation is configured from the engineer assets already task organized with the exploiting force.

The division engineer has several responsibilities when the division conducts an exploitation. First, he plans to support exploitations by providing a flexible engineer task organization to the attacking division. The exploitation mission is likely to be assigned to the division's follow-and-support force or its reserve. The division engineer must not ignore the contingency of exploitation operations. He must ensure that the follow-and-support force and the reserve force have sufficient engineer forces to conduct exploitation operations. Second, as with a MTC, the situation is unclear. The division's G2 will rapidly develop information requirements pertaining to the area of interest for the exploitation. This will be used to develop intelligence requests for intelligence-gathering units. The division engineer supports the G2 in this process by quickly providing information requirements for engineer missions. These include locations and size of obstacles and the location of the enemy force covering them, enemy and friendly use of scatterable mines that will impact the mission, the status of specific bridges key to the operation, and the impact of terrain and weather on mobility operations. Third, the division engineer must be sensitive to the sustainment posture of the engineer force supporting an exploitation and ensure, through constant coordination with the DISCOM, that the sustainment requirements are identified and met.

The division engineer plans mobility and countermobility operations designed to maintain the momentum of the exploiting force so that he can rapidly execute its assigned mission. He must not ignore the engineer support requirements for the follow-on support force reserves. The FXXI division engineer will rapidly develop friendly and enemy intelligence information using ASAS-RWS and MCS-ENG. He will also conduct a terrain analysis using products derived from the DTSS and UAV/ASTAMDS to determine—

- Mobility and climatological impacts.
- Location of enemy obstacles and forces covering them.
- Enemy and friendly use of SCATMINES that will impact the mission.
- Status of specific routes and bridges key to the maintenance of mobility.

Organic and corps engineer assets supporting the exploiting force may consist of Grizzly and Wolverine, as well as other equipment resources, to assist in the rapid movement of the exploiting force. The focus of this engineer support force is on breaching obstacles, spanning gaps while traversing rugged or unimproved terrain, or improving mobility corridors to facilitate movement of the exploiting force. The division engineers may employ Raptor ICO sensors and Hornet munitions on the flanks of the exploiting force to provide early warning of impending attack and to repel an attack if initiated.

Follow-and-support units initially prevent the enemy from closing the gap in a penetration and relieve any exploitation forces that have been left behind to secure key terrain. They also secure LOCs, neutralize bypassed enemy formations, expand the area of exploitation, and block movement of enemy forces into the area. The division engineer will provide engineer support to these forces in the form of countermobility, force protection, and sustainment support. For example, the division will ensure that engineer elements supporting the follow-and-support forces are equipped to handle the hardening of C2 facilities, constructing or improving fighting positions, constructing obstacles, or laying mines to block the advance of reinforcements into the AO.

Pursuit

A pursuit is a natural extension of an exploitation. It differs from the exploitation in that its primary function is to complete the destruction of an enemy force that is in the process of disengagement. While a terrain-oriented objective may be given, the enemy force itself is the primary objective. The pursuit generally consists of forces that apply direct pressure and forces that encircle the enemy.

The direct-pressure force prevents enemy disengagement and subsequent reconstitution of the defense and inflicts maximum casualties. To accomplish this mission, the direct-pressure force attacks constantly on a wide front. The division engineer's priority in supporting the direct-pressure force is mobility operations. The direct-pressure force must have the capability to conduct decentralized, in-stride breaching operations. The direct-pressure force performs its secondary missions of enveloping, cutting off, and destroying enemy forces through the use of maneuver and engineers to support mobility requirements. The countermobility and survivability requirements of the direct-pressure force are minimal, although the capability to conduct them as contingencies must be present in the flexible engineer force.

The encircling force's mission is to get to the enemy's rear rapidly, block its escape and, together with the direct-pressure force, complete the enemy destruction. The division engineer's initial priority is to provide mobility support as the encircling force gets into position, then countermobility and survivability to block the enemy force. Due to the nature of the pursuit and its similarities to the exploitation, the engineer planning considerations and actions are the same as those of an exploitation.

The FXXI division is better able to conduct pursuit operations due to its mobility, enhanced SA, and ability to maintain contact with the enemy.

With his enhanced SA, the FXXI division engineer can anticipate engineer requirements and quickly transition resources and realign support priorities. For example, the pursuit of a disorganized enemy may result following the successful seizure of an objective. Maintaining the momentum of the attack may quickly become a function of the division engineer and DIVEN units. At this point, the division engineer may focus engineer priorities on the improvement and maintenance of MSRs by supporting corps engineers while the organic engineers continue to support in-stride breaching requirements of the attack force.

OFFENSIVE OPERATIONS: LIGHT DIVISION

Light divisions conduct five types of offensive operations. They are—

1. MTC.
2. HATK.
3. DATK.
4. Exploitation.
5. Pursuit.

FM 71-100 contains a description of each type of offensive operation. The light division applies the basic forms of maneuver and conducts the five types of offensive operations to maximize the division's capabilities and minimize its limitations. The light division's method of operation is to disperse widely throughout a large area and conduct synchronized but decentralized operations. The division conducts offensive operations exploiting the advantages of restricted terrain and limited visibility.

The division engineer must understand the concept of employment of the light division and the principles and organization of each operation. He applies the engineer offensive planning procedures (discussed earlier in this chapter) to develop an appropriate engineer force allocation and scheme of engineer operations to support light division offensive operations.

Movement to Contact

The division conducts a MTC to gain or regain contact with the enemy, limiting the risk to the smallest possible part of the force. The remaining force is then available to immediately respond when contact is made. Once contact is made, the commander can further develop the situation, maneuver and concentrate forces, and conduct a HATK or hasty defense.

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CHAPTER 4

Defensive Operations

The main purpose of the defense is to defeat an enemy attack, While military operations focus on maintaining the initiative through offensive action, the defense is an inherent part of any offensive operation. The defense is only a temporary state to facilitate offensive action. The division uses the defense to gain time for force buildup or to economize forces in one sector while massing forces for an attack in another. Likewise, a division may use defensive operations immediately following a successful attack to secure its objectives, develop the situation further, rebuild combat power, or deal the enemy a final, decisive blow. In any case, the defense is a critical means to successful division offensive operations. Therefore, it is imperative that engineers understand the art of the defense.

Division and corps engineer forces play a vital role in giving the division a decisive edge while conducting the defense. Engineers must understand the characteristics of defensive operations and how they apply to engineer operations. They must also appreciate how both engineer forces and missions integrate into the division's defensive framework. The engineer estimate process remains as the base planning tool for integrating into division defensive plans. While the process remains the same, each step is tailored to the needs of defensive planning. These fundamentals of engineer integration into division defensive operations are equally applicable to armored or light divisions.

The unique nature of engineer support to armored or light divisions stems from differences in their respective tactics, engineer organizations and capability, and METT-T. Later sections in this chapter are dedicated to engineer support of armored, light, and mixed division defensive operations. These sections use the defensive framework to establish a force-tailored foundation for engineer support to the security force; the MBA; and the reserve, deep, and rear operations.

With the advent of digital systems and sensors, the division command and staff should, through their enhanced SA and RCP of the battlefield, be able to transition to offensive operations much quicker than an analog division. The commander and staff of the FXXI division, through collection of real- or near-real-time data, will be able to make continuous assessments of an enemy's strengths and weaknesses while gaining time for force buildup or to economize forces in one sector while massing forces for a surprise attack in another sector.

The engineer-estimate process is the engineer planner's basic-planning tool. In the FXXI division this planning tool is augmented by digital systems which enable and speed the planning process. Systems such as ASAS-RWS, MCS, CSSCS, DTSS, and Integrated Meteorological System (IMETS) are used to facilitate comparative analysis, wargaming or COA development, decision-making, and help integrate engineer plans into the FXXI division's overall defensive plans. This provides to each step of the engineer-estimate process the information necessary for a needs analysis in support of the division's defensive planning. Note: No matter how the information is collected the fundamentals of engineer integration into the division's defensive operations has not changed and applies to both heavy and light divisions.

CHARACTERISTICS OF DEFENSIVE OPERATIONS

To effectively support a defense, engineers must understand the four distinct characteristics of the defense and their relationship to engineer operations. Characteristics of division defensive operations are—

- Preparation.
- Disruption.
- Concentration.
- Flexibility.

Preparation

Defensive operations have a distinct preparation phase which is vital to the division's success. The defender arrives on the battlefield first and is afforded the opportunity to choose his ground and set the conditions for the battle. Engineer functions and forces are a critical component in setting the conditions for combat and giving the division the edge against an attacker.

The success of engineers in the preparation phase depends largely on the ability of the division engineer to conduct integrated planning with the division staff and parallel planning with subordinate unit staff engineers. The division engineer uses engineer channels to disseminate the information and intent needed to foster early planning at all levels.

At the division level, engineer planning and preparation must provide centralized focus for the defense, while allowing decentralized integration and execution. The division engineer uses the scheme of engineer operations, obstacle capability and control, and survivability guidance to focus the division's subordinate unit's engineer efforts. The division engineer resources subordinates through task organization and the allocation of Class IV/V (obstacle) supplies. This allows subordinates to anticipate limitations on their capabilities and prioritize and rapidly identify shortfalls in resources.

Engineer participation in division preparations is not limited to the close operation in the MBA. The division engineer considers the full range of engineer requirements of the total defensive framework: deep, security, MBA, reserve, and rear operations. Each element of the defensive framework is considered during engineer mission analysis and accounted for in the division scheme of engineer operations.

The topographic terrain team in the FXXI division conducts an extensive terrain analysis of topographic data and data sets generated from the DTSS database or collected from multiple agencies that provide mapping or geospacial data. This analysis provides the division commander and his subordinate commanders and staff with the terrain and battlefield visualization needed to refine information voids relative to terrain, and the analysis shows how both friendly and enemy forces may use the information. Initial decisions, such as when and where to strike and mass, can now be determined well in advance with digitally generated intelligence and topographic products.

During the preparation phase, the division engineer and his staff conduct integrated and parallel planning with the division staff and subordinate commanders and staffs through established C2 systems and channels. The division engineer uses “swivel chair” interfaces, voice, or the MCS to digitally disseminate his scheme of engineer operations, obstacle zones, and survivability guidance to focus subordinate efforts and foster early planning. To facilitate coordination, he and his staff will share or disseminate critical information with higher, lower, and adjacent units to ensure unity of command and integrated actions at all levels. The division engineer provides a central focus for the division effort while providing the flexibility needed by the subordinate engineer commanders to aggressively act, as required.

The FXXI division engineer staff draws logistical planning information from the CSSCS and MCS or through direct communications with the G1, Adjutant, or G4, Supply Officer, to determine engineer resources requirements (such as personnel, equipment, and Class II, IV, and VI supplies) in support of the defense. During mission analysis, this enables the division engineer and his staff to consider the full range of engineer requirements and how engineer digital and C2 systems can be used to maximize support for these operations. See Chapter 5, FM 71-100, for a discussion of the defensive framework.

NOTE: The FXXI division has a distinct advantage over previous organizations in the preparation phase for defensive operations. This division's ability to visualize the terrain using its digital terrain data and instantaneously coordinate the commander's guidance are major advances in reducing the time required to synchronize the defense. This division's extensive SA, down to the lowest level of command, and combined with the speed and flexibility of the engineer-directed SCATMINE obstacles, provides timely and accurate interdiction of the enemy's movement and the ability to mass effects against the enemy where and when required.

Disruption

The division defense includes a focused attempt to disrupt the enemy effort through deep, security, and deception operations. The division engineer works closely with the division staff to ensure that engineer functions are integrated into deep operations. For example, the division engineer may nominate deep targets that directly attack the enemy's engineer capability. Likewise, the division engineer ensures that engineer aspects of deep and MBA operations are mutually supportive. Engineers provide the security force with the countermobility needed to disrupt the enemy's attack early and the mobility it needs to fight a fluid battle. Deception can play a major role in disrupting the enemy's attack by targeting the enemy's decision cycle. Deception operations can employ a combination of forces and obstacles that cause the enemy to commit combat power prematurely or against a strength perceived as a weakness.

Concentration

In the defense, the division concentrates forces to exploit or create an enemy weakness. Engineers support the concentration of combat power by employing obstacles, constructing fortifications, and providing mobility to counterattack or reserve forces. The principal role of engineers is normally in the employment of tactical obstacles. Engineers employ tactical obstacles to support the scheme of maneuver and directly attack the enemy's maneuver. Tactical obstacles are integrated with the defender's fires to disrupt, turn, fix, or block enemy maneuver, concentrating combat power to create and exploit a weakness. Engineers also construct fortifications and protective obstacles to give the force an edge over enemy fires and to break an enemy assault. Defending from survivable positions is vital to maintaining concentration until the attacker is destroyed. Finally, engineers provide mobility to counterattack forces and reserves to allow the division to take offensive action and exploit a broken enemy attack.

Flexibility

Flexibility is a critical characteristic of division defensive operations. The division must retain the flexibility to employ counterattack and reserve forces and operate within the enemy's decision cycle. Engineers assist the division in maintaining flexibility through situational obstacles in the MBA, task organizing for rapid transition to the offense, and improving or maintaining the routes needed to shift forces. Engineers plan the use of situational obstacles in the MBA as *be prepared* missions that allow the commander to react to the enemy's attack. Situational obstacles can be employed by themselves or to reinforce the existing effort. The division engineer must recognize the mobility requirements inherent in maintaining the flexibility of division reserve and counterattack forces. He plans for mobility by task organizing engineers with these forces, controlling the division obstacle effort (obstacle control measures), and anticipating rapid transitions to the offense.

FXXI engineer systems and improved munitions add to this flexibility. For example, Raptor ICO provides the division commander with both an early warning capability and the flexibility to observe, then when it is most advantageous, to interdict the enemies' movement. Another group of munitions that the engineer will identify to assist in providing the division flexibility and setup favorable conditions, are scatterable mines. Whether delivered via artillery, from aerial platforms or by ground units, these munitions can be employed to the front, flanks, or rear of an advancing enemy force to disrupt his attack. The greatest aid to flexibility that FXXI systems provide the division engineer, is his enhanced SA and his ability to move key information throughout the force. This rapid exchange of information assists the defense by providing supporting elements more time to adjust to changing conditions.

DEFENSIVE PATTERNS

Division defensive operations generally take one of two traditional patterns: mobile and area defenses. The fundamental difference between these patterns is their focus-and-defeat mechanism. The scheme of engineer operations to support division defensive operations is tailored to the type of defense. The focus of engineer effort, unit missions, and task organization are all inseparably linked to the focus-and-defeat mechanism of each type of defense. Therefore, the division engineer must understand the area and mobile defense and their implications on engineer functions and unit operations.

Mobile Defense

The focus of mobile defense is the destruction of the enemy attacker. The mobile defense is organized to permit the enemy to advance into a position which exposes him to counterattack and envelopment by a mobile reserve. Therefore, the mobile defense trades space and time for achieving a decisive advantage against the enemy. The defeat mechanism is a large, mobile reserve which must have combat power and mobility equal to or greater than the targeted force.

The division engineer must understand the implications of a force-oriented defense on both engineer functions and operations (Figure 4-1). Engineer support to the mobile defense concentrates on using obstacles to attack enemy maneuver and preserving the mobility of the friendly force. Obstacle planning is more closely linked to the enemy's most probable maneuver course of action than to terrain. It must support attacking the enemy's maneuver in a way that supports his destruction by counterattack. Consequently, obstacle planning is more restrictive than permissive and reduces the flexibility of the brigades. This serves to mass brigade obstacle effort at critical areas and preserves the mobility of the counterattack force in the MBA.

Survivability effort is also tailored to a force-oriented defense that trades space and time for creating an enemy weakness to exploit by counterattack. To create the conditions for counterattack, the brigades must fight the depth of their sectors from multiple primary and subsequent battle positions. Fortification efforts support fighting quick engagements from multiple positions by providing primary and alternate hull-defilade fighting positions in both primary and subsequent battle positions. The nature of the fight reduces the overall need for protective obstacles throughout the defense. Protective obstacle effort is concentrated in final subsequent positions where the penetration must be blunted to allow counterattack.

The defeat mechanism of the mobile defense is the counterattack by a large, mobile reserve with combat power and mobility superior to the targeted enemy force. The division engineer supports the mobility of the mobile reserve in two ways. First, he uses obstacle control measures to ensure that brigade obstacle efforts do not limit the mobile reserve's freedom to

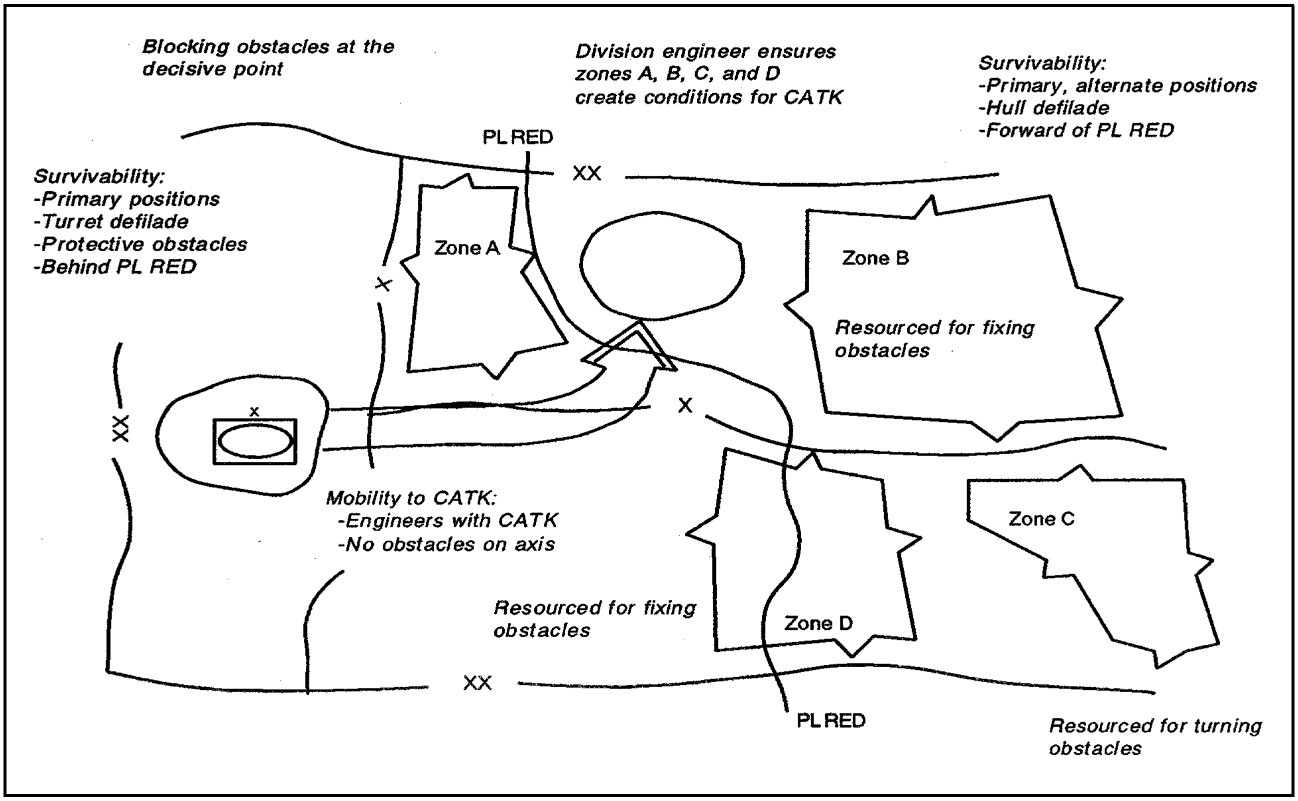

Figure 4-1. Mobile defense

maneuver. Second, he ensures the mobile reserve has the necessary dedicated engineer support to maintain its mobility during the counterattack. It must be able to counter the enemy's offensive use of obstacles or reduce friendly obstacles as required by changes in the situation. Above all, the counterattack cannot be stalled by a lack of mobility. The division engineer must weigh the trade-off between dedicating engineer forces to the counterattack and the obstacle and survivability requirements of the MBA.

The FXXI division engineer ensures the mobile reserve has the necessary dedicated engineer support to maintain its mobility by attaching resources such as Grizzly or Wolverine.

Obstacle zone planning is closely linked to the IPB and the enemy's most probable maneuver course of action supported by a continuous feed of real- or near-real-time data from the other staff cells and subordinate engineer units. The division engineer maximizes the use of terrain while massing brigade obstacles based on review of DTSS products and terrain analysis. The obstacle zone plan is designed to support the destruction of the enemy through counterattack by using a mix of natural and man-made obstacles to shape the manner in which he conducts his maneuver (such as disrupt, turn, or fix). The division engineer and his staff will identify natural obstacles, direct construction of man-made obstacles, and integrate both aerial- and FA-delivered scatterable mines. Raptor ICO sensors (when fielded) and Hornet munitions can be integrated with these obstacles at critical junctures along the enemy's route of march. The aerial- and FA-delivered mines would be emplaced to the enemy's front and rear. Raptor ICO (when fielded) would be employed initially in an unmanned mode. The enemy's movement will be tracked using JSTARS, UAV, Comanche, LBE, and ground sensors such as the Raptor ICO or the IREMBASS. Upon activation of the Raptor sensors, the ICO control station will activate Hornet to—

- Blind, deceive, or kill critical R&S elements or other enemy combatant forces.

- Canalize the enemy into a kill sack for attack by the mobile reserve.

The division engineer and his staff plan, coordinate, resource, and oversee survivability tasks performed in support of the force conducting the defense. The division engineer and staff will provide topographic products and terrain analysis data to the brigade commanders and their supporting engineers for use during selection of their battle positions. Data derived from the DTSS will also aid in the positioning and siting of weapons systems, C2 nodes, and other high-value assets (HVAs).

Because of the mobility implications in a mobile defense, the division engineer must specify detailed obstacle control measures (obstacle zones and restrictions) that account for maneuver mobility requirements. DTSS and other digital enablers can be used to determine time/distance factors and terrain impacts on unit displacements.

Area Defense

The focus of the area defense is on the retention of terrain. The area defense is organized to absorb the enemy into an interlocked series of positions from which he can be destroyed. In this pattern, the defeat mechanism is the interlocking nature of defensive positions and small mobile reserves within subordinate defenses to defeat local penetrations. The area defense does not promise outright destruction of the attacker and may require other simultaneous or subsequent operations to achieve a decisive defeat of the enemy.

The division engineer must understand the implication of the area defense on M/S requirements and engineer operations (Figure 4-2, page 4-5). Likewise, the scheme of engineer operations orients on the retention of terrain and on enabling the division to concentrate fires from fixed positions. The location of key and decisive terrain plays a major role in organizing the area defense and becomes the focus of obstacle and survivability effort.

The role of the division engineer involves identifying missions, allocating resources, and synchronizing and controlling engineer functions. By the nature of the defense, countermobility and survivability are the primary missions that drive engineer force, resource allocation, and synchronization. Therefore, planning for countermobility and survivability consumes the majority of the division engineer's time. The engineer estimate process incorporates the obstacle planning process. The obstacle planning process does not preempt the use of the engineer estimate. The engineer estimate provides the total integration of engineer functions (mobility, countermobility, survivability, topographic, and sustainment engineering) into the division planning process.

The location of key and decisive terrain rapidly assumes a major role in the division commander's organization of the area defense and defines division engineer support. Engagement areas (EAs) and the control and distribution of fires are keys to a successful area defense. The division engineer will rely heavily on the division topographic terrain team and the DTSS to produce topographic products and terrain analysis to facilitate division-wide planning. Once identified, the key and decisive terrain becomes the focus of the division engineer's obstacle and survivability effort in support of the area defense. Topographic maps and other data sets are disseminated to the division's subordinate commands via MCS to enable planning and mission execution, and to facilitate "bottoms-up" resource requirements through the parallel planning process. For example, based on the topographic and terrain analysis data provided, brigade commanders will select primary, alternate, and supplementary battle positions for the battalions, companies, platoons, and reserves. They will also select primary and alternate concealed routes that may be used to move into and out of these positions. This data can also be used to identify how the enemy may employ his indirect-fire weapons systems based on slope analysis. This data also aids the positioning of weapons platforms based on an ability to observe and direct fires.

The challenge of a defending force is to strip away the enemy's initiative and create exploitable vulnerabilities. The answer to this challenge is obstacle integration. The synchronization of indirect and direct fires and tactical obstacle effects is crucial to being successful. Obstacle control, intent, and resourcing are top-down driven, while obstacle integration with fires is generally bottom-up. The obstacle planning process provides the foundation for this integration. The obstacle planning process steps are listed below:

1. Situation analysis.
2. Organization of the operation.
3. Mobility and future operations requirements.
4. Obstacle resourcing.
5. Scheme-of-obstacle overlay.

Figure 4-4, page 7a, shows the interrelationship of the obstacle planning process and the

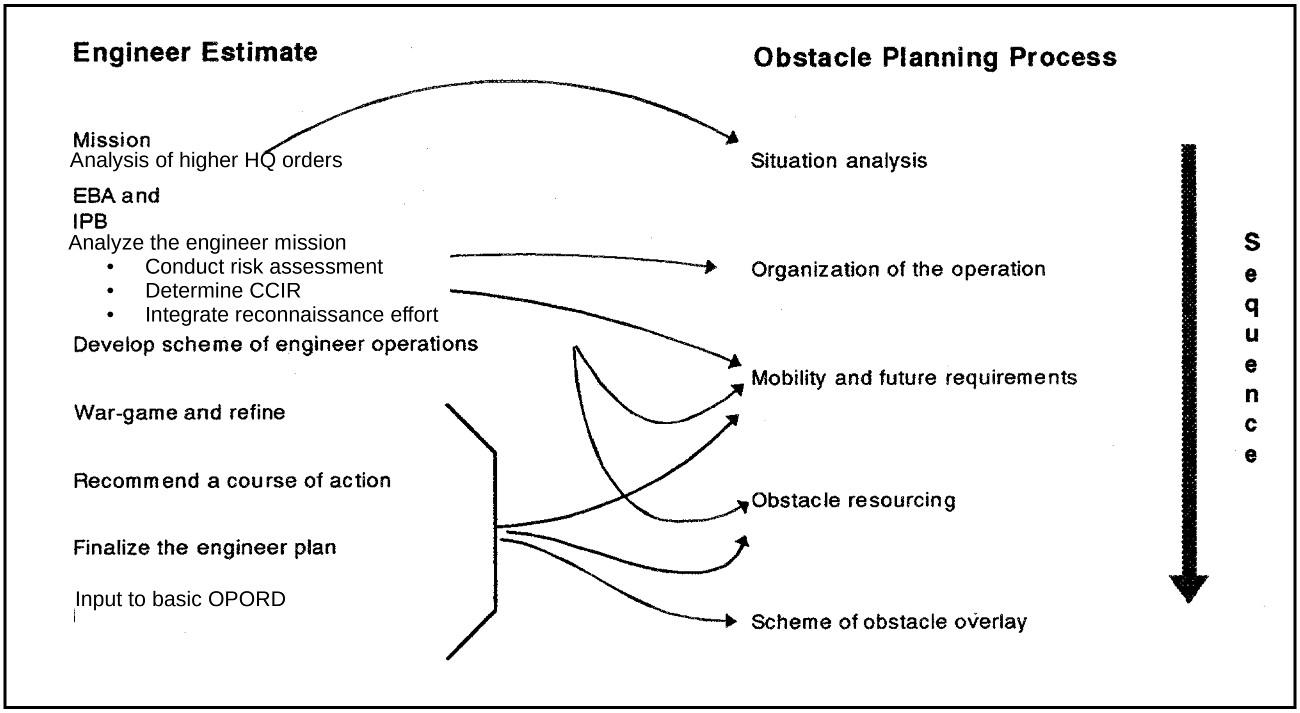

Figure 4-4. Engineer estimate and obstacle planning process

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engineer estimate. Before the obstacle planning process can be discussed, the echelons of obstacle planning and obstacle control principles must be understood.

Echelons of Obstacle Planning

Specific obstacle synchronization techniques and control measures are relative to maneuver planning levels—division, brigade, and task force or battalion. Divisions, brigades, and task forces plan obstacle zones, belts, and groups, respectively. In some cases, corps may designate obstacle zones to division. Normally, obstacle zone planning is initiated by division. These obstacle control measures permit tactical obstacle placement and focus subordinate units in their tactical obstacle effort. The obstacle control measures not only focus obstacle effort for subordinate maneuver commanders on specific areas of the battlefield but can provide guidance on the specific obstacle effects (disrupt, turn, fix, and block) on the attacking enemy. This additional guidance is provided by obstacle intent. Refer to Figures 4-5 and 4-6, page 4-9, for a summary of the echelons of planning and a sample graphic portrayal. Before discussing the functions of obstacle zones, belts, groups, and individual obstacles, obstacle intent must be defined.

Obstacle Intent. Designating the obstacle effect—disrupt, turn, fix, or block—is not enough to synchronize fires and obstacle effort or to complement the scheme of maneuver. In order to focus the entire force, the maneuver commander and his supporting engineer designate an obstacle intent. Obstacle intent describes how, in terms of obstacle effects, the commander will use tactical obstacles to effect the enemy's maneuver to the advantage of his fire plan (direct and indirect). The obstacle intent establishes a direct link with the obstacle and fire plans. To accomplish this integration and synchronization, obstacle intent contains three components: an obstacle effect, a target, and a relative location on the battlefield.

The *obstacle effect* is conveyed through the use of precise graphics. Figure 4-7, page 4-10, depicts the obstacle-effects graphics. The maneuver commander and staff engineer must understand the flexibility of these graphics. Each symbol represents exactly how the enemy's maneuver should be altered. For example, a turn symbol points to the desired direction for the enemy formation to follow. Refer to Figure 4-8, page 4-11, for examples of how obstacle belts alter the enemy's formation through the use of obstacle groups.

A *target* refers to the enemy whose ability to maneuver is the target of the obstacle and fire plans. The target is relative to the subordinate unit's force allocation ratio. An armored maneuver brigade conducting a prepared defense will normally fight an enemy division. Maneuver battalions and companies in a prepared defense will fight an enemy's brigades or regiments and battalions, respectively.

The *relative location* of the battlefield refers to the use of obstacle control measures. Figure 4-6, page 4-9, depicts the relative locations for each planning echelon. Obstacle zones and belts use an enclosed, unspecified obstacle symbol. Obstacle groups use the obstacle-effect symbol alone on the exact terrain where direct and indirect fires will be integrated and synchronized with individual obstacles.

The obstacle intent's components enable the force to focus, integrate, and synchronize combat power with obstacles. A fully developed obstacle intent brings together—

- The situation template, by defining the target.

The division's main effort and when it changes gives the division engineer a guide in determining obstacle zone priorities and weighting the main effort with engineer resources (manpower and materials). Certain synchronization requirements impact obstacle-zone planning across the defensive framework. The division engineer considers division control and synchronization measures as he develops the obstacle zone design (see the next principle).

Balances Maximum Flexibility Versus Focusing Obstacle Effort. Designing obstacle zones is a balancing act between providing maximum flexibility and focusing tactical obstacle employment for the subordinate maneuver commander. Maneuver brigades are normally given sectors to defeat the attacking enemy but may be given a battle position or strongpoint. The battle position and strongpoint are more restrictive control measures. Defending in sectors gives the brigade commanders the freedom to maneuver and also decentralizes fire planning; whereas, the battle position dictates where the majority of the brigade's combat power will be positioned. Even with a more restrictive control measure as the battle position, brigades still require flexibility in tactical obstacle employment. The strongpoint is the most restrictive, and obstacle zone flexibility is greatly reduced and focused.

The division engineer provides the required flexibility with obstacle zone graphics through two dimensions: width and depth. The obstacle zone permits the brigade commander to employ tactical obstacles to complement his decentralized fire planning and his allocation of maneuver battalions, whether in sector or battle position. The maneuver brigade is assigned a sector or battle position based on the attacking enemy's combat power along a specific avenue of approach. At bare minimum, the width of the obstacle zone encompasses the avenues of approach. The maximum flexibility for an obstacle zone width is the entire subordinate's sector. The commander must understand that a zone covering an entire sector may restrict his ability to seize the initiative with a counterattack. Ideally, this risk should be considered during war gaming. Two exceptions for not providing this flexibility are facilitating future operations (discussed in the next principle) and obvious no-go terrain (against an enemy armored force), which prevents the enemy's ability to maneuver.

The depth of the obstacle zone is tailored to the division's scheme of maneuver and the commander's intent. Specific phase lines normally aid in tailoring the depth of the obstacle zone. For example, one brigade might be given the mission to defend well forward in the sector. The obstacle zone would facilitate this intent by allowing less depth. Typical graphics that aid in focusing the depth of an obstacle zone are on-order boundary changes, battle handover lines (BHLs), rear boundaries, forward edges of the battle area (FEBAs), lines of departure (LDs), lines of contact (LCs), fire-control lines (fire-support coordination lines (FSCLs), no-fire areas (NFAs), coordinated fire lines (CFLs)), passage lanes and corridors, and phase lines controlling friendly force positioning.

Facilitates Future Operations. To facilitate future operations, the division engineer uses obstacle zones as a restriction of tactical obstacle employment. Directed and reserve obstacles are the only exceptions for obstacles outside an obstacle control measure. The division's need for future mobility drives the need to restrict tactical obstacles. The division's counterattack force's axis and objective are standard examples for the division's future mobility needs. Another example is for the division to reposition forward as a subcomponent of the corps plan. The restrictions fall into two categories: decreasing flexibility and obstacle restrictions. Decreasing flexibility involves reducing the depth and width of individual obstacle zones. Shaping obstacle zones so that they do not overlap the counterattack axis and objective ensures the freedom of the counterattack force. Obstacle restrictions place limits on the method, type, and location of obstacles authorized to be emplaced within an obstacle zone or belt. Typical examples are allowing surface-laid mines only, restricting the use of antihandling devices, specifying a no-later-than self-destruct time for scatterable mines, or a no-later-than disarm time for munitions (Hornet/Raptor). These obstacle restrictions facilitate future occupation and clearing of the obstacles by friendly forces.

Mission Loads. Mission loads consist of those materials required for a specific mission formulated as engineer Class IV/V packages or combat configured loads. Standardized engineer Class IV/V packages are configured and dictated by unit standard operating procedure to provide commanders flexibility in achieving their unique operational and mission support requirements.

Mission loads are a maneuver responsibility regardless of the command and support relationships specified for engineers. Logistical planners within the engineer and maneuver force structure must understand the requirement for integration of the maneuver commander's intent, obstacle resourcing requirements, and their planned controlled supply rates at brigade and division level when developing Class IV/V packages. Class IV/V planning requires a degree of crosswalk and coordination between the division engineer cell, division G4 planner, maneuver brigade S4, engineer battalion S4, and the brigade forward support battalion support operations officer.

Corps assets normally push the quantity of Class IV/V packages. Delivery of Class IV/V packages residing with the FSB will stretch or exceed the transportation assets of the TF and the FSB S&T platoon. Class IV/V packages for the defense is one of the most demanding logistics operations the TF must carry. It requires all the assets that can be made available and a total cooperative effort by the TF, including engineers.

Time planning for Class IV/V packages is generally conducted on 12 or 18-hour increments, but will vary depending on division and corps standard operating procedures. The concept of Class IV/V packages is preconfigured loads such as a standard fix minefield, MICLIC reloads, Volcano reloads, demolitions, and wire packages, pushed to the user at the obstacle emplacement site. Thorough planning includes the quantity and type of packages, maneuver TF logistical release points (LRP), and the time of linkup. Because corps packages run on 12- or 18-hour increments, logistical planners must integrate with operational planners on the type of operations (defense or offense) they are supporting at that time increment. Logistical planners at the brigade level must focus on future operations at least 72 hours out. Changing a corps package may require at least 9 hours of lead time.

Obstacle Planning Process

The echelons of obstacle planning and obstacle control principles provide the foundation for the obstacle planning process. At division level, the staff and engineer plan zones to control and focus obstacle effort for subordinate units. There are two techniques for developing obstacle zones and resourcing the zones with obstacle capability. One technique is to develop tentative belts, group the belts into zones, and resource the zones with obstacle capability based on the tentative belts. That is the technique used for these scenarios.

Another technique develops zones and task organization based on the scheme of maneuver and resources the zones with obstacle capability based on the division main effort, priorities, and task organization. This technique is normally used when time is a critical factor in the planning process. This technique involves some risk. Zones are developed based on division-level graphics.

Like the engineer estimate, obstacle planning steps are conducted concurrently as the scheme of maneuver is developed.

Situation Analysis. The goal of situation analysis is twofold for the division engineer. They must know the templates (doctrinal, situation, and event) that the division staff develops and the EBA. The key questions the division engineer concentrates on are—

- How will the enemy allocate his combat power?
- Where will the enemy array (two levels down) his forces and his formation norms?
- When will the enemy attack?
- How will the enemy weight his main effort?
- What are the enemy's objectives and tactical options or alternatives?
- How will the enemy use his engineer and mobility assets? (Focusing on mobility for his forward forces and countermobility for his flanks.)

The answers to these questions provide the division engineer the foundation for understanding and participating in the development of scheme of maneuver and engineer operations. This specifically shows how, where, and when the enemy will attack and where he is going (his objectives). The event template could also identify vulnerabilities or windows of opportunity which effect tactical obstacle employment.

Organization of the Operation. The division staff and G3 develop courses of action using the steps outlined below:

l. Analyze relative force ratios.

2. Array initial forces.

3. Develop scheme of maneuver.

4. Determine C2 means and maneuver control measures.

5. Prepare course of action statements and sketches.

The division engineer must know how the G3 develops the course of action. With the information gained from the situation analysis, the G3's array of friendly forces is based on the situation template and relative force ratios. For example, a ratio of 1:3 and 1:16 are the norms for a prepared defense and delay. The G3 takes his array of forces and develops a scheme of maneuver and determines C2 measures and requirements. The engineer sketches tentative obstacle belts to support the array of forces and the scheme of maneuver. This provides the initial start in tailoring obstacle zones to support the scheme of maneuver for that particular course of action.

The array of friendly forces, scheme of maneuver, and C2 measures and requirements aid the division engineer in envisioning the subordinate maneuver commanders' fight. Basically, the division engineer considers the two obstacle-zone dimensions. The obstacle zones for the division must complement the defeat mechanism. General guidelines can be used in relation to the defensive patterns, as mentioned earlier. The division engineer uses the array and allocation of friendly forces on specific avenues of approach and maneuver control measures to sketch proposed obstacle zone boundaries.

Mobility and Future Operations Requirements. The division engineer alters the proposed obstacle zones based on the division's mobility requirements and future operations. The second and third obstacle control principles (supports the division's scheme of maneuver and the commander's intent and facilitates future operations) are directly applicable for this step. The division engineer identifies areas which must be free of tactical obstacles and where obstacle restrictions are required to facilitate future operations. These areas cause the proposed obstacle zone's boundaries to be adjusted and specific restrictions (if applicable) assigned to certain zones. Other mobility operations, such as a passage of lines on lands, may require division reserve obstacles. The obstacle zones arc finalized and tied to maneuver graphics and terrain.

Obstacle Resourcing. There are two basic ways to resource obstacle zones. One technique is to allocate resources based on task organization. For example, if the division has 15 engineer companies, the resource allocation for each company is 1/15 of the resources available after the main effort has received their initial resource allocation.

Another technique is to resource the obstacle zones based on the division commander's intent, scheme of maneuver; and subordinate maneuver units' subunit instructions, which have been captured with tentative obstacle belts. The division engineer patterns obstacle intents based on assumptions of how the subordinate maneuver commander will fight. Complete understanding of the situation analysis step facilitates this process. The width of the avenue of approach that the assumed obstacle belt straddles is multiplied by the obstacle intent resource factor (indicated below).

Obstacle effect	Resource planning factor
Disrupt	0.5
Turn	1.2
Fix	1.0
Block	2.4

This provides the amount of linear obstacle effort required in the obstacle belt. The division engineer can sum the total linear effort required for all the planning belts and translate this sum into manpower, material, and time required using standard planning factors and obstacle packages.

The division engineer must also anticipate the subordinate maneuver brigades' survivability requirements. The EBA analysis of friendly capabilities of organic and corps engineer forces provides an approximation of the survivability capabilities within the division engineer battalions supporting the maneuver brigades (HHC for division light engineer battalions). The subordinate brigades' missions drive the allocation. As a norm, a brigade conducting an area defense requires a more intense blade effort than a mobile defense. Based on standard survivability planning factors, the division engineer can task organize corps engineer assets based on the anticipated needs of the committed brigades.

At the end of this step, the division engineer overlays the necessary engineer C2 requirements over their allocation of resources. This is inputted into the division's task organization. The obstacle-zone graphics, obstacle restrictions, responsibilities, and special considerations are finalized.

Scheme-of-Obstacle Overlay. The scheme-of-obstacle overlay is normally an appendix to the engineer annex at division level. The scheme-of-obstacle overlay contains the following elements:

- Engineer task organization.
- Obstacle-zone graphic.
- Obstacle-zone table depicting responsibility and priority.
- Obstacle intent (three components), if applicable.
- Passage lanes that require reserve obstacles, if applicable.
- Obstacle restrictions by obstacle zone, if applicable.

This overlay provides the subordinate maneuver commanders and their engineer staff the necessary tools to initiate the planning process.

ENGINEER SUPPORT TO AN ARMORED DEFENSE

In the defense, armored divisions seek to maximize their firepower, mobility, and shock effect. They may defend by initially delaying the enemy to determine his intentions and then by launching strong counterattacks against his flanks and rear in prepared areas. FM 71-100 further describes how armored divisions conduct defensive operations. Engineer planning focuses on each area of the defensive framework–deep, security, MBA, reserve, and rear operations. The division engineer uses the engineer estimate to identify engineer missions; synchronize mobility, countermobility, and survivability; and allocate resources. The obstacle planning process previously discussed is the tool for integrating obstacles into the division scheme of maneuver.

The deactivation of the division engineer brigade and the establishment of the DIVEN staff section has changed the role of the FXXI division engineer.

The functions typically performed by a division engineer have not changed. However, the FXXI division engineer and his staff can, using digital systems, be more responsive in the performance of these functions and to other requirements of the division and the maneuver commanders.

With the introduction of new automated C2 and information management systems, enhanced mobility capabilities, and improved weapons systems, the division engineer has become a major link in the defensive planning and execution process. In particular, the C2 and information management systems are used by the division engineer and his staff to develop a visual picture of the relationship between friendly and enemy forces in terms of time, space, and purpose.

With the ability to move information rapidly between ABCS and other FXXI systems, the division engineer and his staff must become experts on the acquisition and manipulation of information derived from a myriad of systems and sensors. This will facilitate the maintenance of engineer SA and the development of an engineer RCP.

They must also be adept on the transfer of information between C2 systems to enhance collaborative staff planning, coordination, and synchronization of engineer effort. This enables the rapid determination of engineer support requirements. It also enables the task-organization process and the arrangement of resources required to support tactical operations.

Throughout the divisions' battle space, the FXXI division engineer, will utilize digital systems and capabilities, to assist in the support of defensive operations, for the following purposes —

- Deep operations.
  - To provide the commander and staff, terrain and battle-space visualization using DTSS-generated terrain products and analysis.
  - In formulating plans for and coordinating the employment of Raptor ICO sensors (when fielded) to enhance intelligence collection and targeting of enemy engineer HVT.
  - Compiling plans and recommendations for the use of situational obstacles such as deploying the Raptor ICO's Hornet munitions and scatterable mines to help shape the division battle space.
  - In directing, coordinating, and controlling obstacle-zone planning efforts through MCS.
  - To collaborate with the G2, G3, and FSE through the MCS to identify obstacle intent, location, and timing related to execution criteria and decision points.
- Security operations.
  - To Plan for use and employment of Raptor ICO sensors (when fielded) in a force-protection role.
  - Collaborating with the G2 and G3 using MCS for the employment of disrupting obstacle zones and belts.

- For directing, coordinating, and controlling obstacle-zone planning efforts through MCS.
- In the development of engineer task organizations and the allocation of resources to accomplish in-stride breaching, perform demolition tasks, collect mobility data, mark lanes through obstacles, and carry out other mobility tasks. FXXI resources to be considered include such systems as the Grizzly; the Wolverine; and the Land Warrior reconnaissance equipment for sapper—and engineer reconnaissance—teams.

• MBA and reserve operations.

- To develop and compile recommended engineer task organizations with the G3 using MCS.
- To allocate resources in support of M/CM/S requirements using MCS and CSSCS databases.
- In disseminating orders and taskings to engineer units in support of the forward maneuver brigades and reserves using MCS.

• Rear operations.

- To develop and disseminate plans and operational overlays using MCS to protect and sustain rear-area operations.
- For contingency plans via MCS to counter the use of enemy scatterable mines.
- In developing and communicating engineer task organizations with corps engineer augmentation, utilizing the MCS.
- Provides the corps engineer group specific engineering tasks using MCS. These tasks clearly define roles and responsibilities to be performed by the corps engineers in support of rear-area mobility and sustainment missions.
- Uses MCS to disseminate digital overlays that clearly define information and control measures used in rear-area operations.
- Plans for and coordinates the employment of engineer munitions such as Raptor ICO and SCATMINES to provide early warning and force protection.

The following is a division scenario illustrating the integration of engineer operations into the division defensive framework.

Division Scenario

The division's mission is to conduct a defensive operation to defeat an attacking corps consisting of three mechanized divisions forward of phase line (PL) LAKE. The graphic portrayal of the division's scheme of maneuver and engineer organizations available are depicted in Figure 4-10. Corps will conduct deep operations forward of PL SEA, targeting the enemy's advance guard.

The division's scheme of maneuver is a four-phase operation:

Phase 1- Preparation/counterreconnaissance.

Phase 2- Defense forward of PL STREAM.

Phase 3- Counterattack.

CHAPTER 5

OTHER TACTICAL OPERATIONS

The division conducts other tactical operations to support both offensive and defensive operations. In many cases, these operations are an inherent part of an offensive or defensive plan. In all cases, they require special considerations during planning and execution. The division engineer must have a fundamental understanding of these operations and their inherent special engineer considerations. The engineer missions involved in supporting other division operations are essentially the same as those outlined for offensive and defensive missions. Furthermore, the principles of C2 of engineers still apply during planning and execution. The division engineer uses the special considerations below to refine the offensive or defensive engineer mission analysis and force allocation.

RETROGRADE OPERATIONS

A retrograde operation is an organized and orderly movement of forces to the rear of or away from the enemy. A division may be forced to conduct a retrograde operation due to enemy action or when directed by corps. There are three basic types of retrograde operations: delay, withdrawal, and retirement. A delay is an operation in which the division trades space and time to inflict maximum damage on the enemy without decisive engagement. A withdrawal is an operation in which a division in contact withdraws to free itself for a new mission. A retirement is an operation in which a division not in contact moves away from the enemy. A division normally conducts a retrograde by combining a delay, withdrawal, and retirement in simultaneous or sequential action. For example, a portion of the division may conduct a delay to facilitate the division withdrawal and retirement.

There are four major underlying considerations in planning and executing any retrograde operation. They are—

- **Leadership and morale**. Commanders at all levels must maintain the offensive spirit among subordinate leaders and troops during the retrograde operation.

- **Surveillance and reconnaissance**. Tracking the enemy situation must be aggressive and accurate; it becomes critical as forward combat power is reduced.

- **Mobility**. The division must achieve superior mobility advantage over the enemy force by providing for division mobility and degrading that of the enemy force.

- **Battlefield deception**. Deception operations target the enemy force to cause indecision and delay enemy actions and to prevent him from concentrating combat power at friendly weaknesses.

While the division engineer organization contributes to each of these fundamentals, the dominant role of engineers is in achieving superior mobility over the enemy. Mobility and countermobility operations performed by the division engineer in a FXXI division are also enhanced by digital systems, emerging weapons systems, and mobility platforms. With the advent of Raptor ICO (Hornet), Grizzly, and Wolverine, the FXXI division engineer will have the ability to maintain a pace on the battlefield equal to the mobile forces. He will also have improved capabilities in intelligence gathering and force protection. When still in contact, division retrograde operations require centralized planning and control and decentralized maneuver against the enemy. Delaying and withdrawing brigades and squadrons in contact with the enemy require maximum freedom of action to maneuver and degrade the enemy's maneuver. Therefore, the division engineer assists the division in achieving a mobility differential by allocating the necessary engineer forces and scatterable mine assets to forward units. He recommends an engineer task organization that supports in-stride breaching down to the task force level. Additionally, the division engineer must plan obstacle zones that permit flexible use of scatterable mines with execution released to forward commanders.

In the FXXI division, digital and improved mobility systems will complement the retrograde process. For example, the FXXI terrain-analysis cell of the terrain detachment at the DMAIN will provide topographic products, data sets, and timely digital overlays that reflect obstacle and terrain information to facilitate R&S activities and the division's flexibility to conduct rearward movement. MCS and other digital database systems will allow for better SA to moving units on a dirty battlefield. The division engineer recommends the tailoring of engineer force structures and identifies the resources to facilitate the accomplishment of such tasks as conducting engineer reconnaissance, improving routes, constructing combat trails, repairing or replacing destroyed or interclass bridges, breaching manifolds and other obstacles, and clearing routes. As part of degrading enemy mobility, the division engineer will provide task organization recommendations to supplement covering forces and rear guard forces. These engineer assets will be equipped to employ situational or man-made obstacles designed to disrupt or block enemy movement and prevent contact and the decisive engagement of friendly forces. In this case, the DIVEN elements may also be equipped with various scatterable mines and the Raptor ICO (when fielded). To support R&S missions, the division engineer will ensure that the engineer elements are resourced with systems like Grizzly, Wolverine, and Land Warrior to support in-stride breaching or mobility requirements. In rear areas, corps engineers augment the division engineers to assist in the preparation of protective fortifications for combat vehicles, the development of subsequent defensive positions, and improvement of routes and trails.

The DIVEN organization also contributes to division reconnaissance and surveillance. The division engineer works with the division staff in focusing intelligence-collection efforts on key information requirements that indicate enemy strengths, weaknesses, and intentions. The division engineer assists the division G2 cell in analyzing combat intelligence, particularly enemy engineer activities. For example, a delaying unit may report a concentration of low-density breaching assets indicating the location of the enemy's main effort. The division engineer also assists in developing information requirements that trigger high-value targeting. For example, he may plot the location and employment of enemy assault bridges, recommend their location as a PIR, and recommend their destruction as a HVT.

The FXXI division engineer utilizes links between the DTSS and other national, strategic, and tactical map resources to meet information requirements with current digital topographic data (DTD). Critical to timely retrograde operations, the engineer's on hand DTSS capability provides rapid and responsive topographic support for terrain products. The FXXI division engineer's DTSS, with its topographic terrain team, —

- Enhances command and staff terrain visualization.
- Supports movement and maneuver of R&S elements.
- Maximizes the use of terrain for mobility and countermobility purposes.

Engineers contribute the most to the delay and withdrawal phases of a retrograde operation. The focus of engineer missions is again on mobility and countermobility. The division engineer recommends a task organization of the division and supporting corps engineer battalions to provide mobility and countermobility support to the forward units in contact and enhance the mobility of' division units not in contact, In order to expedite the rearward movement, corps engineer units construct, improve, and maintain withdrawal routes for combat, CS, and CSS units.

Retrograde operations in the FXXI division are enhanced through the ability to effect coordination electronically. Liaison between lower, higher, adjacent, and supporting HQ is critical to retrograde operations to ensure that all participants in the operation have a clear understanding of their roles and missions. The speed with which information and information products can be disseminated and shared vertically and horizontally between FXXI units ensures the maintenance of SA and the RCP of the battle space.

RELIEF IN PLACE

A relief in place is a combat operation in which all or part of a division in a combat area is replaced by another division. It is normally ordered when the relieved unit is in either a hasty or a deliberate defense. The relieving unit usually assumes the same defensive responsibilities and initially deploys the same as the relieved division. Key considerations in planning and executing a relief in place are—

- **Secrecy**. Because of the inherent vulnerabilities created by a relief in place, the operation must be concealed from the enemy for as long as possible; deception and operations security (OPSEC) are all-important from the outset.
- **Speed.** Relief operations are extremely vulnerable to enemy spoiling attack once they begin. Unnecessary delays during execution must be avoided to prevent giving the enemy time to acquire, target, and mass fires on the relief.
- **Control.** Intermingling forces place increased demands on division C2, particularly if enemy contact is made during the relief.

Engineers contribute the most to a relief in place by assisting the division in achieving speed and control. Therefore, these become the focus of the relieving and relieved division engineers during joint planning and execution. As the two division G3s collocate to develop the maneuver plan for the relief in place, the division engineers develop a unified scheme of engineer operations.

NOTE: With digital systems, the G3 and division engineers need not have time-consuming interfaces to conduct planning. Plans and associated graphics can be shared via MCS and VTC white boards to discuss details or changes and modifications to the basic defense plan and concept for the relief in place.

Both division engineers must fully understand the entire scope of the mission, including the defensive plan and concept for the relief in place. Understanding both the defensive plan and the relief-in-place plan are critical to determining the engineer tasks that must be accomplished to maintain speed and control during the operation. Engineers help achieve this by—

- Providing mobility to both the relieving and relieved units.
- Expediting the turnover of obstacles.

In the FXXI division, a relief operation can be rapidly planned, coordinated, and rehearsed. The G3 can prepare the plan with associated graphics, produce the orders and rapidly disseminate the order digitally using MCS. Coordination may be achieved through the sharing of information and information products via digital systems complemented by VTC white boards that are used to conduct face-to-face discussions related to planning factors and to facilitate understanding related to mission planning and execution.

NOTE: If the relieving unit is analog, the digitally equipped division staff must ensure that traditional TTP are followed in regard to the sharing of information.

The division engineers of both the relieving and relieved units must recommend engineer task organizations that provide in-stride mobility operations to battalions moving to, through, and from friendly defensive positions. Collocated CPs also facilitate speed through a rapid but thorough turnover of obstacles. Obstacle locations, configuration, and composition are consolidated and provided to the relieving unit. The two division engineers must also develop detailed plans for the turnover of division reserve targets and situational obstacle plans. Actual turnover is effected at the subordinate unit level.

In the FXXI division, the target and obstacle information, may be obtained through the transmission of digital obstacle overlays prepared by all subordinate engineer units to the DMAIN MOB cell. The relieved division engineer and staff will subsequently prepare a consolidated listing of obstacles, prepare an updated digital obstacle overlay, and provide this information to the relieving division engineer and staff.

The division engineers assist their respective divisions' control of relief-in-place operations by providing detailed mobility planning, developing a detailed obstacle-turnover plan, and providing LNOs to maintain engineer continuity during the relief. When planning for mobility operations, division engineers review the relieved unit's defensive plan overlaid with the relief-in-place concept. The routes for the entering and exiting units must be clearly identified and marked.

In the FXXI division, a terrain analysis performed by the terrain-analysis team will aid the process through the identification of routes and avenues for entering and exiting units. These routes are clearly marked on digital overlays with mobility requirements determined for each route. The relieved DIVEN has the responsibility for fully preparing and allocating mobility resources to assist in preparing these routes for movement. Both DIVEN will also ensure that their respective DIVENs have been properly resourced to conduct in-stride breaching operations with systems, such as the Grizzly, in the event lanes are closed during movement.

The division engineers determine mobility tasks that are required on each route. The relieved division has the responsibility to fully prepare the routes through its sector. The relieved division engineer allocates mobility resources to assist in the preparation of these routes. Additionally, both division engineers must ensure that their respective divisions have the capability to conduct in-stride breaching operations in the event a lane is closed during movement.

When developing the obstacle-turnover plan, the relieved division engineer must have detailed and current status on the obstacles in his sector. While initially focused on obstacle control measures, he now focuses on individual obstacles and compiles a complete obstacle list and overlay. He receives updated obstacle reports from all subordinate units and determines the details of how the obstacles are to be exchanged, to include reserve targets and situational obstacles.

When both divisions are digitally equipped, the relieved DIVEN will receive a digital overlay, which provides a complete listing of enemy and friendly obstacles within the division's AO via the MCS-ENG. In addition, he will update this overlay following the receipt of digital or voice obstacle reports and determine how the obstacles will be exchanged, to include reserve targets, situational obstacles, and RCU-controlled (encoded) scatterable mines.

The presence of engineer LNOs at every echelon of the relieving unit down to maneuver company or team level is critical to the speed and control of obstacle turnover. Upon linkup, engineer LNOs with the relieving units become thoroughly familiar with the existing obstacles, including the direct- and indirect-fire control measures integrated with the obstacles. The LNO then assists the relieving maneuver commander in integrating existing obstacles into the current maneuver plan. The relieving engineer also advises the maneuver commander on plans for upgrading the defense to allow for any adjustments made to the defensive plan. Rapid, efficient turnover is critical for two reasons. First, it ensures that the maneuver commander is immediately capable of using the existing obstacles as a combat multiplier in defeating the enemy. Second, it expedites shifting engineer effort from obstacle turnover to improving the unit's defensive posture or preparing for the subsequent attack.

PASSAGE OF LINES

A passage of lines is an operation in which one force moves through another. A passage of lines can be conducted either forward or rearward. The engineer considerations for each are similar and depend more on whether the division is *passing* or *in-place*. Major considerations are-providing the passage of engineer control, the exchange of information, and the mobility of the passing force.

The passage of control between passing and in-place divisions is one of the key considerations in any passage of lines. The commanders of the two divisions must establish a mutually agreed-upon event that triggers the passage of control. Once control is passed, the passing division exercises tactical control (TACON) over the in-place division until all of its forces are beyond the direct-fire range of the in-place division. During a rearward passage of lines, however, control is passed from the rearward-passing unit to the In-place division unit. Forces in the rearward-passing division become TACON to the in-place division once they are committed to the passage routes or corridors.

The division engineers must have a thorough understanding of when engineer functional and unit control is passed and the disposition of engineer forces and missions at the time of passage. When control is passed between the divisions, the corresponding DIVEN commander may assume TACON of all engineer forces of the passing or in-place division. The controlling DIVEN commander can then task engineers of the adjacent division based on immediate requirements during the passage. This is critical in the forward passage of lines, since it affords the passing DIVEN commander with a means of accomplishing unforeseen engineer tasks with minimal impact on engineer support to the subsequent attack.

Close coordination and joint planning between division engineers are critical to the success of the passage of lines. The division engineers of both the passing and the passed divisions collocate during the planning and execution of the passage of lines. They focus initially on exchanging information. This information includes individual obstacle locations and routes through the sector. It also includes the details of reserve target and situational-obstacle execution. The passing division engineer then ensures dissemination of the information to subordinates through coordination with the G3 and instructions in the division's OPORD, engineer annex, and overlays.

Whether conducting a forward or rearward passage, the in-place division has the responsibility to provide mobility for the passing unit along cleared routes or corridors through its sector. The In-place division engineer conducts a complete analysis of the passage-of-lines concept of operations. The in-place division normally tasks subordinate maneuver units to prepare the routes or corridors. The division engineer recommends a task organization of engineer forces to the maneuver brigades, based on the assets needed to clear assigned routes and corridors. Clearing operations must be completed prior to the initiation of the passage. Additionally, the in-place division engineer must plan the closure of lanes through obstacles, if required, once the passage is complete.

The passing division organizes for in-stride breaching operations prior to initiating the passage of lines. This is to ensure rapid support for mobility operations and the continuation of the passage in the event a route is shut down during the mission. Creating lanes through the in-place unit’s obstacles requires permission from the division exercising TACON. Authority to reduce friendly obstacles in response to an immediate tactical situation may be given to subordinate units. This authority is included in coordinating instructions. Under all circumstances, this action must be reported to the passed unit so that the obstacle can be repaired. The division engineers must closely monitor the passage during execution to advise the respective division commanders on the impact of such occurrences.

C2 of both the passed and passing unit engineers during the passage of lines also transfers to the division exercising TACON. The division engineer of the division with TACON must facilitate control of the engineer units during planning and execution of the passage by having an accurate status of all engineer assets, activities, and obstacle control measures in the sector. This includes the status of all reserve targets and situational obstacles, including the execution criteria for each.

The complexities associated with the C2 of a passage of lines are greatly reduced by a division equipped with digital systems. In the FXXI division, planning and coordinating a passage of lines may be facilitated by the sharing of digital information in the form of orders, free text messages, and graphic overlays. For example, digital overlays that graphically display control measures; routing; passage points; lanes; and corresponding information related to recognition signals, roles/responsibilities, and battle handover, can be disseminated to all elements of the division.

Brigade and below units of the division also have the ability to conduct precision movement while maintaining real-time situational awareness using the Force XXI FBCB2 systems. In addition, they also possess the ability to identify friend from foe through the tank or Bradley-mounted Battlefield Combat Identification System (BCIS). Engineer elements facilitate this process by accomplishing joint planning that encompasses digital information exchanges through MCS, and MCS-ENG to effect TACON of engineer units as the passage of lines is conducted. The division engineer and his staff will plan for the use of the Grizzly, the Wolverine, and other engineer mobility systems (when equipped) to complement these operations. They will also give consideration to the establishment of situational obstacles and the use of Raptor ICO in the area vacated by the withdrawing unit.

NOTE: The FXXI division engineer and staff, in addition to providing engineer support to brigade and below maneuver elements, must develop standard procedures for controlling EAD engineers, without digital C2 systems (MCS, FBCB2), that are required to operate in the division’s battle space.

LARGE-SCALE BREACHING OPERATIONS

A large-scale breaching operation is defined as a breaching operation conducted by brigades and divisions to create a penetration through well-prepared defenses and pass follow-on brigades or divisions. A large-scale breach is not a separate tactical operation but can be an inherent part of a division or corps offensive operation. By its nature, a large-scale breach requires increased division involvement in suppressing, obscuring, securing, and reducing the enemy's obstacles and defensive positions. The phases of a large-scale breach are—

- **Attack to the obstacle:** the buildup of division combat power at the point of penetration.
- **Breach and assault:** initial penetration of the enemy's defenses by the lead brigades.
- **Secure the breachhead:** clearing forces within the breachhead; securing the lodgment against counterattack,
- **Passage of follow-on forces:** forward passage of follow-on forces through the breachhead and battle handover.

The above phases of a large-scale breach are not separate and distinct from those of the maneuver plan. Instead, they are a framework for integrating large-scale breaching operations into the overall plan of attack. Elements of each phase are integrated into the phases of the scheme of maneuver.

The division engineer must understand how the conduct of a large-scale breach impacts on engineer missions, force allocation, and C2. With the increased, more active role of the division comes a corresponding increase in the role of the division engineer in planning and executing division-level engineer missions. Engineer support during the attack to the obstacle and breach and assault phases is the same as discussed in Chapter 3 for a division DATK. Likewise, the considerations to support a forward passage of lines discussed previously apply in planning for the passage of follow-on forces. However, there are also maneuver requirements unique to a large-scale breach that the division engineer must consider in developing a scheme of engineer operations.

The first maneuver requirement that drives special engineer planning is that of projecting large combat formations through a heavily obstacle area. This requires the division to establish a lane network quickly through the enemy's defense. The lane network must make maximum use of the achieved penetration and posture follow-on forces for continuing the attack. Whether the follow-on force is a subordinate brigade or follow-on division, establishing the lane network is a division-level responsibility. In coordination with the G3, the division engineer must anticipate lane requirements, develop a tentative plan for the lane network, and allocate the necessary engineer forces. He bases his recommended force allocation on the number of lanes to be reduced and the number and length of routes to be improved or maintained through the breachhead. He closely monitors the breaching plans of the lead brigades. He must envision the end state of the breach and assault phase to determine how many lanes, in addition to those made by the breaching brigades, must be reduced by engineer follow-and-support forces. The number of lanes in the lane network must support simultaneous forward passage of combat forces as well as the sustainment traffic (two-way passage) for brigades securing the breachhead.

The engineer effort involved in establishing and synchronizing the lane network with the breaching efforts of the forward brigades may require central division-level functional and unit control of engineer forces. In this case, the DIVEN commander may control all engineer units committed to the lane effort on behalf of the division commander. This is a situation that will call for the deployment of the DIVEN TAC to provide the DIVEN commander with forward C2. The DIVEN TAC facilitates synchronization of the large-scale breaching operation by aggressively tracking the brigade fights through the division TAC CP and continuously cross talking with the division main CP and the DIVEN commander.

The second maneuver requirement that merits special engineer consideration is securing the breachhead from counterattack. Once the lead brigades have seized footholds within the enemy's defensive positions, forces committed on the far side of the obstacles become extremely vulnerable to counterattack. Furthermore, the lack of a developed lane network hampers mutual support of forward forces by brigade and division reserves. Therefore, the division engineer must consider the use of obstacles as a combat multiplier to assist in securing the breachhead line as well as the use of obstacle control measures to preserve the mobility of follow-on forces.

The division engineer plans for the use of obstacles by anticipating requirements and establishes obstacle zones that support hasty defenses, if necessary, but keeps passage corridors open for follow-on forces. Normally, obstacles supporting brigade hasty defenses are employed as situational obstacles triggered by enemy counterattack. To foster responsive obstacle support to brigade hasty defenses, the brigades must have the necessary assets and emplacement control. The division engineer uses the enemy situation and event templates to estimate the required resources and assess how responsive emplacement must be. Both are key factors in recommending the allocation of obstacle capability to maneuver brigades.

Obstacle location may be directed by either the division or the brigades. Where the avenues of approach are well-defined and enemy courses of action are limited, the division may decide to direct the location of obstacles executed by the brigades. This technique minimizes risk in executing obstacles that may affect future movement and aids in synchronizing division-level fires to cover the obstacle. However, the norm is to allow the brigades and battalions to decide actual obstacle locations based on their plans for a hasty defense. In this case, the division engineer ensures that the brigade obstacle plans support the division plan and do not conflict with the plans for the passage of follow-on forces or future division operations.

The employment of improved engineer C2 systems and mobility platforms will contribute to all phases of the large-scale breach. The division engineer and the G2 aid in the terrain and battlefield visualization process and the identification of exploitable enemy weaknesses. For example, the topographic team will conduct a detailed terrain analysis using topographic products generated by the DTSS to determine an attack axis and define mobility impacts. UAV, and satellite platforms will downlink real- or near- real-time imagery or information products to identify enemy obstacles and equipment. FXXI initiative systems, such as LRAS3, HS3, and DRS, will be used to augment existing terrain and engineer intelligence data. The information derived from these systems enhances suppression, obscuration, and security actions in support of the engineer's obstacle reduction effort.

Engineer systems, such as Grizzly and Wolverine, will significantly improve the projection of large combat formations through heavily obstacled areas. Use of DRS, MCS, and FBCB2 facilitates the sharing of information for routing to and through obstacled areas and for posturing follow-on forces to continue the attack.

In the FXXI division, the division engineer facilitates synchronization of large-scale breaching operations by tracking the brigade fight through the DTAC CIC. The FXXI division engineer is able to maintain a high state of engineer SA through a number of DTAC and MOB cell digital systems and sensors. The ability to rapidly share information between the DTAC and the DMAIN enables coordination, planning, and decision-making. Raptor ICO will complement existing situational obstacle capabilities, enhance the division’s ability to secure the breachhead from counterattack, and foster positive obstacle support to hasty defenses.

Obstacles may be established with a greater degree of precision using information derived from DTSS, ASAS-RWS, DRS, UAV, JSTARS, Raptor ICO, and other sensors. For example, based on real- and near-real-time information provided by both ground and airborne sensors, the division is better able to direct the establishment of obstacle zones and the location of obstacles executed by the brigades.

RIVER-CROSSING OPERATIONS

River-crossing operations generally fall into one of three categories: hasty, deliberate, and retrograde. The engineer planning considerations for each are generally the same, although some of the planning steps In a hasty crossing may be eliminated. FM 90-13 establishes the base doctrine, tactics, and techniques for planning, preparing, and conducting river-crossing operations.

A deliberate river crossing is an attack that Is planned and carefully coordinated with all concerned elements based on thorough reconnaissance, evaluation of all intelligence and relative force rations, analysis of various courses of action, and other factors affecting the situation. It requires extensive planning, detailed preparation, and centralized control. A deliberate river crossIng is expensive in terms of manpower, equipment, and supplies. It is generally conducted against a well-organized defense when a hasty river crossing is not possible or has been conducted and failed. This type of river crossing requires the sudden, violent concentration of combat power on a narrow front, in an area where there is a high probability of surprise.

Deliberate river-crossing operations consist of the following four phases: advance to the river, assault across the river, advance from the exit bank, and secure the bridgehead line. These four phases are executed by the following three forces: bridgehead, support, and breakout. The division engineer uses the phases of a river crossing as a base framework for analyzing and identifying required engineer tasks and allocating forces. He then uses the forces of a river crossing as a basis for recommending a task organization of engineers within the division. Key division engineer considerations in planning and executing a deliberate river-crossing operation are—

- Establishing effective engineer C2 in the crossing area.
- Task organizing the appropriate mix of engineers for each of the river-crossing forces.

The division engineer recommends which unit should perform the crossing-force headquarters responsibility. The choices are the DIVEN headquarters or a corps engineer group headquarters. The division engineer's recommendation is based upon METT-T.

The division engineer recommends the optimum engineer task organization for engineers supporting the bridgehead, support, and breakout forces. He uses his EBA mission analysis as the basis for recommending engineer force allocation. He must identify any shortfalls and submit requests for additional assets to the G3, who requests them from corps.

Engineers supporting the bridgehead force must be capable of conducting In-stride breaching In order to sustain the momentum of the attack to seize and secure the lodgment, exit-bank, intermediate, and bridgehead objectives. Engineers must be capable of Installing situational obstacles to block counterattacks against the bridgehead. Finally, engineers supporting the bridgehead force must be capable of maintaining and upgrading exit-bank routes to facilitate the rapid passage and force buildup of the breakout force.

Engineers task organized to assist the support force must be capable of bridging the river and assisting in traffic control. Corps engineers normally augment the division to do these tasks. Corps combat engineers may reconnoiter and develop crossing sites, operate assault boats, man engineer regulatIng points, and assist in controlling traffic and marking routes within the crossing area. Corps bridge units build and operate heavy rafts and assault float bridges.

A retrograde crossing is a movement to the rear across a water obstacle while in contact with the enemy. Retrograde crossings are planned in the same detail as deliberate crossings. The division engineer plans to support both the mobility requirements of the portion of the force conducting the river crossing and the mobility, countermobility, and survivability requirements of the portion of the force left in contact with the enemy.

In the FXXI division, planning is enhanced by an increased capability to conduct both long-range ground and airborne intelligence gathering and reconnaissance. The G2 and the G3 will use digital systems such as UAV, JSTARS, LRAS3, HS3 to locate and track enemy forces in close proximity to river-crossing sites. At the same time, the DIVEN will use his digital collection assets to obtain detailed obstacle- and river condition- data. This detailed engineer information, is relayed from reconnaissance elements equipped with Land Warrior and FBCB2, to separate brigades', and division MOB cells' equipped with MCS and DTSS work stations. Within each CP, operations-, intelligence-, and engineer-data, is combined into fused intelligence that is portrayed with terrain digital information on the ABCS. This new information will facilitate terrain and battle-space visualization, a more accurate evaluation of force ratios, course of action development, and other factors that may affect the crossing and tactical decision-making. Planning, coordinating, synchronizing the operation, and preparing orders are also enhanced via information shared between the engineer staff and maneuver elements using MCS, ASAS-RWS, CSSCS, DTSS, and FBCB2.

The base framework planning process is enabled by the DIVEN's ability to maintain a greater degree of tactical awareness and SA through real- or near-real-time digital textual and graphical data. The division engineer and his staff will conduct an in-depth analysis of the terrain in and around the river-crossing site and the objective area as part of the EBA process. The focus of this analysis is to determine slope, trafficability, and hydrological data using information products provided by DTSS, DRS, and engineer reconnaissance reports. The division engineer will also use the G2's UAV and JSTARS data to determine obstacles and enemy engineer activity on the far shore and in the vicinity of the bridgehead. DTSS and other digital planning tools can be used to determine time/distance impacts of enemy forces that could potentially threaten the brigade head.

The division engineer ensures that uncommitted engineers are on order to execute mobility tasks to clear scatterable munitions, clear road blockages, or construct bypasses to shift traffic movement from one crossing site to another. He is responsible for all engineer functions within the bridgehead, crossing area, and division rear.

The division engineer and his staff, as part of the support force, will be responsible for the developing crossing sites and allocating crossing means. The DIVEN, provides the division's point of contact to—

- **Fill all information voids:** related to river-crossing and bridgehead objectives
- **Determine total engineer:** support elements requirements,
- **Coordinate:** pre-position equipment, supplies, and other BOS support to the river crossing operation.

The division engineer will also provide mobility support to all phases of the river crossing-operation until they hand off the mission to follow-on engineers. This includes support to—

- **The initial elements of:** the assault force as they proceed to bridgehead and exit the far shore.
- **The remainder of:** the assault force's elements as they conduct their movement through the river crossing area.

- **The follow-on:** supporting forces and CSS/CS elements.

To provide this mobility coordination, the DIVEN must ensure that division engineers supporting the bridgehead force are capable of bridging the river and conducting in-stride breaches to sustain the division attack's momentum and to enable seizure and security of the lodgment, exit bank, and intermediate and bridgehead objectives.

NOTE: Experience and the concentrated use of digital technologies and systems, such as DTSS, Wolverine, and Grizzly, are required to validate or mature emerging TTP related to in-stride breaching. However, these systems, when coupled with an ability to maintain a high state of SA and a RCP through FBCB2, may foster the use of in-stride breaching as the most practical breach method used during high-operations tempo (OPTEMPO) operations.

Engineer elements supporting assault and follow-on forces must also be capable of maintaining and upgrading exit-bank routes to facilitate the rapid passage and force buildup of the breakout force. Corps engineers normally augment the division to accomplish these tasks and assist MP elements with traffic control. During execution of the river crossing, corps engineer elements may operate assault boats, man engineer regulating points, and assist in controlling traffic and marking routes within the crossing area. Securing the division's bridgehead requires control of an area large enough to accommodate the assault forces and essential support elements of the crossing force on the exit bank. Defensible terrain and space within the bridgehead are required to conduct a defense against an enemy counterattacking to regain control of the riverbank. Therefore, the division's organic engineers may perform M/CM/S tasks on the far shore to support bridgehead forces, and to facilitate force buildup and sustainment of the assault force, and facilitate the rapid passage of follow-on and support forces. For example, to ensure mobility of the assault force as it exits the far shore, the division engineer will ensure that the assault force is equipped with systems, such as Grizzly, to support in-stride breaching and sustain the desired attack momentum to secure bridgehead objectives.

NOTE: In the FXXI division, the aviation assets of the division aviation brigade can be used as air assault forces to secure terrain in the bridgehead. In this operation, the ADC-M can conduct the river crossing from the A2C2S while maintaining real- or near-real-time SA and RCP.

The same engineer elements must be capable of installing situational obstacles to block counterattacks against the bridgehead. These situational obstacles may be either aerial- or artillery-delivered SCATMINEs or Raptor ICO's Hornet munitions. Synchronization and integration of these engineer requirements, actions, and systems will require close coordination. This is accomplished through the digital and/or manual exchange of information between the corps, the division engineer, G2, G3, G4, and the supporting maneuver brigade engineer elements. The specific ABCS equipment that provides this obstacle information exchange includes: ASAS-RWS, DTSS, MCS, CSSCS, and FBCB2.

A requirement to cross water obstacles during retrograde operations is likely. The planning and execution of river crossings during retrograde operations are similar to other water-obstacle crossings. However, the division engineer and his staff must take into account the following considerations:

- **C2.** Delaying, defending, and supporting forces require explicit missions and tasks. This is no different for the engineer elements supporting river-crossing operations. Effective liaison is key and may be accomplished through the exchange of digital graphics or personnel before the start of the operations. Discussions held via VTC and white boards with retrograding units, crossing-force headquarters, and supporting units will complement rehearsal of the operation, clarify roles and missions, ensure unity of effort, and enable mission understanding.

- **Deception.** Deception operations are planned and executed to conceal the extent of the operation and the actual crossing site to be used. Smoke and other battlefield obscurants, electronic deception, and dummy sites are a few methods that will be used to reduce the enemy's capability to disrupt the crossing. Digital systems will facilitate the exchange and sharing of graphical data related to these deception operations and VTC white boards will complement the success when these operations are carried out.
- **Crossing sites.** The division engineer and his staff are instrumental in the determination of crossing sites. Using hydrological and topographic data generated through DTSS, the division engineer and his staff will plan primary and alternate crossing sites to add flexibility to the operation. In addition, they will be called upon to support requirements at the crossing site and the distant shore. For example, the crossing site must be protected against enemy action by using security forces to counter enemy actions. Therefore, the division engineer may, from his review of topographic products, select covered and concealed positions from which the overwatching force can cover the operations or engineer elements can construct fighting positions for the overwatching force. In addition, division engineers may participate by being task organized as part of the assault force equipped with Grizzly or Wolverine to facilitate continued movement once the obstacle is crossed.
- **Support forces and bridging**. The division commander will attempt to pass all nonessential support forces across the water obstacle early and disperse them in locations that can support the operation. In this case, the division engineer and his staff must develop plans that will allow the rapid recovery of ribbon bridging equipment and its possible replacement with fixed bridging equipment. Recovery planning must include coordination with units conducting retrograde operations to ensure that friendly units are not stranded as a result of planned destruction of bridges or bridging equipment.

S1 Section. Elements of the S1 section operate in the battalion field trains and execute the battalion's personnel services and general administration. S1 personnel in the field trains CP perform the critical tasks of strength accounting and casualty reporting, replacement operations for all division light engineer battalion organizations in the division rear area, administrative services, personnel actions, and limited legal and financial services. They also support the HHC commander by performing CP functions.

S4 Section. Elements of the S4 section operate in the division light engineer battalion field trains and primarily focus on battalion supply functions. This includes direct coordination with DISCOM and the MSB to ensure the flow of critical mission supplies to the forward division engineer companies through the FSBs. Additionally, they support the HHC commander in general CP duties.

Communications Section. The communications section supports the division light engineer battalion subordinate units operating in the division rear area with organizational maintenance. They are responsible for the evacuation of communications assets to DS level maintenance. They also provide assistance to the field trains CP for general CP duties as required.

Maintenance Section. The maintenance section supports the division light engineer battalion with organizational maintenance. It provides maintenance contact teams to support the A&O platoon when it operates in support of the close fight.

Medical Section. The medical section is task organized to provide medical support to division light engineer companies by providing a combat medic to each combat platoon. The senior medic provides combat medic support to the field trains CP.

Division Light Engineer Battalion Field Trains Functions. The division light engineer battalion field trains have the following major functions:

- Establishing and maintaining the field trains CP.
- Coordinating support for the DIVEN CPs.
- Sustaining division light engineer companies operating in the division rear area.
- Supporting the A&O platoon during rear operations and coordinating support during forward operations.
- Self-sustainment.

Sustainment of the DIVEN CPs and the DIVEN command group is coordinated and executed by the field trains CP. The HHC commander ensures integration with the main support battalion through the division HHC by providing the sustainment requirements necessary to support the DIVEN CPs and command group, tracking their sustainment status, and responding to their problems.

The field trains support division light engineer companies with unit sustainment requirements when they are conducting rear operations and not yet task organized with a maneuver brigade. A logistical package (LOGPAC) system is executed using internal battalion assets, drawing the necessary supplies from the MSB. DS maintenance and health services support are obtained through direct coordination between the field trains and the MSB.

The field trains provide unit sustainment for the A&O platoon when they conduct rear operations. The HHC conducts a company LOGPAC drawn from the MSB. Since the HHC has limited fuel-hauling capacity, special coordination must be made for direct delivery by MSB assets or tying in with the fueling plan of the unit they support. Organizational maintenance contact teams are organized to support the maintenance effort of the A&O platoon equipment. DS maintenance and health services support are obtained through the MSB's maintenance and medical companies.

The field trains CP coordinates the A&O platoon's sustainment when they are task organized to support maneuver brigades in the close fight. This is done through the DIVEN REAR or the engineer unit supporting the maneuver brigade. If no other engineer unit is supporting a maneuver brigade, coordination is made through the DIVEN REAR with the maneuver brigade's supporting FSB. The brigade engineer can assist, when needed, to influence this relationship. The MSB is capable of sending an engineer maintenance team to the FSBs to sustain engineer equipment supporting the close fight. Health services support must be coordinated through the closest unit.

The field trains must also be self-sustaining. The HHC first sergeant (1SG), assisted by the supply noncommissioned officer (NCO), plans and executes the sustainment of the HHC. Class I supplies are obtained through the battalion mess section. Other normal unit sustainment needs are fulfilled by routine supply runs to the MSB.

FXXI CSS

Based on corps engineer unit allocations, the EAD engineer force's CSS structure is established forward of the maneuver brigade support area (BSA) in an engineer support area (ESA). The ESA is headquartered by the maneuver brigade's organic engineer battalion ALOC and engineer battalion HHC. The ESA is an area from which corps engineers (combat mechanized, wheel, CSE, bridge, combat heavy) stage and where their supporting maintenance (organic and DS) reside. The same applies to EOD and any other units which are part of the "engineer force" task organization. The ESA will include a distribution node for corps throughput for use by corps engineers and possibly division engineers. The ESA will include a multiunit UMCP to maintain all vehicles (division and corps) in the engineer force task organization. This ESA may or may not be part of a wider brigade forward support area (BFSA), depending on the allocation of EAD engineer forces. The engineer battalion ALOC(-) may be located in the BSA and have responsibilities as an engineer logistical liaison center and brigade rear engineer (METT-TC dependent). (See Figure 6-6.)

The division support battalion (DSB) located in the DSA provides only reinforcing Class III bulk (B) supplies and transportation support to the FSBs and the division aviation support battalion (DASB). The planning and coordination for engineer CSS at the division level is integrated in the DMAIN between the MOB cell and the sustainment cell (DISCOM/G4 staffs) by the DSES.

The mission of the base support company is to provide direct and habitual combat service support to a heavy brigade, area support to divisional units attached to the brigade, and direct support to forward support companies. Figure 6-7 shows the base support company organization.

The division engineer battalion's CSS is received from the base support company (BSC) of their habitual FSB, located in their respective BSA. Within the BSC is an engineer support element (ESE) that consists of fuel, food service, distribution, and maintenance repair teams dedicated to support the companies within an engineer battalion. To facilitate consolidated CSS, support a flexible/agile task organization, and establish a control measure for corps engineers with the BCT, an engineer support area (ESA) is established forward of the brigade support area (BSA). This ESA may or may not be part of a wider brigade forward support area (BFSA), depending on the allocation of EAD engineer forces.

Additional CSS assets from the BSC come from its maintenance, forward repair, and

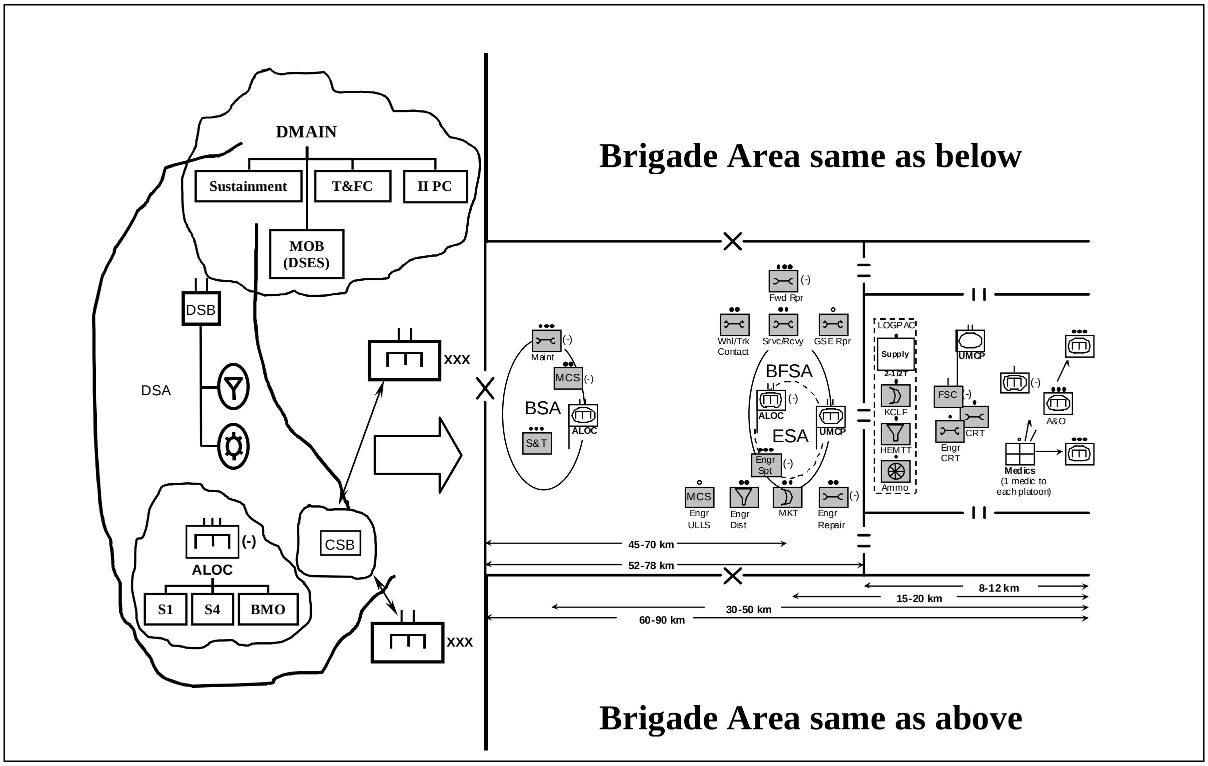


Figure 6-6. DSA/BSA (engineer sustainment)

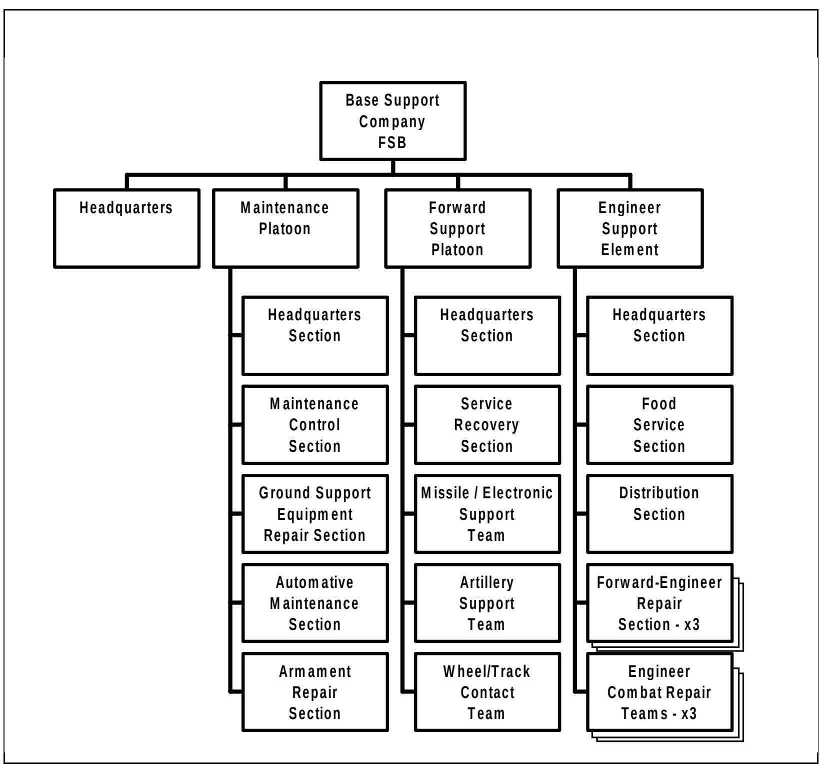


Figure 6-7. Brigade support company organizational chart

supply and transportation platoons. Organic medics in the engineer battalion HHC and combat lifesavers (CLSs) provide combat health support (CHS) within the various engineer platoons. CSS operations must focus on sustaining the force as it executes the commander's intent and conducts deep, close, and rear operations. The measurement of sustainment success is the generation of combat power at the right place and time. CSS planners and executors must integrate with the planners for all organizations to provide the commander with the combat power to accomplish his mission. Sustainment planning must keep pace with the combat unit's rapid decision cycle. Sustainment execution must rapidly and thoroughly support current and future operations.

FXXI engineer sustainment planners and executors, working closely with the DISCOM, must focus on several essential areas to successfully accomplish CSS tasks. First, the engineer CSS planner must keep pace with the division's decision cycle through early, complete, and continuous integration into the division's C2 and CSS structures. Engineer CSS planners must be able to plan and adjust engineer sustainment in concert with the rapid division planning process currently enhanced with the ATCCS. Second, tracking both subordinate and supporting engineer units' sustainment postures allows the sustainment planner to account for available resources, shift them as necessary, and integrate them into planning future operations. Third, detailed coordination with the division's CSS units allows engineer sustainment planners to influence current and future operations by ensuring that continuous and responsive CSS is maintained.

FXXI DIVEN CSS CONCEPT

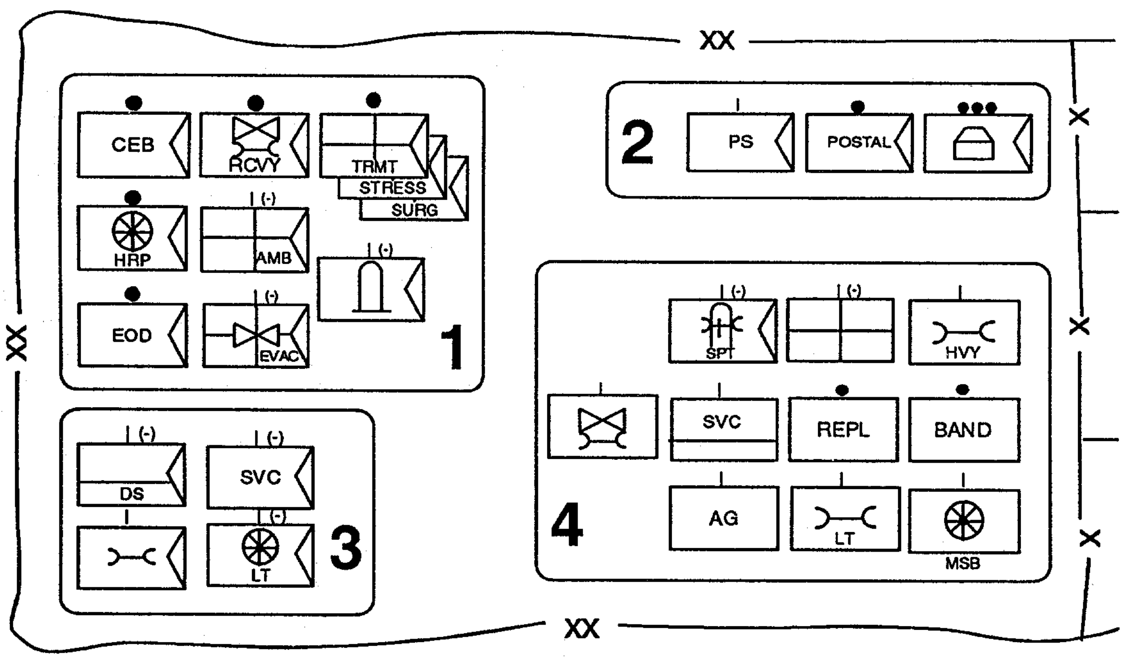
The division engineer and elements of his DSES are located in the DMAIN at the MOB cell. The division engineer DSES cell has no organic capability to sustain itself. It receives logistics, personnel-service, and health-service support from the DSB through the division HHC. The division engineer is assisted by the ADE in developing the engineer sustainment plan, writing the CSS portions of the basic division OPLAN or OPORD, and writing paragraph 4 of the engineer annex. The ADE integrates engineer sustainment into division operations through coordination with the division staff and the DISCOM staff in the DMAIN.

The DISCOM provides division-level logistics support and health-services support through its division FSBs to organic and attached engineer units of the division. However, nondivision units operating in the division area may receive their logistics support from corps logistics units operating in and immediately to the rear of the division. Health-services support requirements for nondivision units are absorbed into the existing division medical support structure, which is augmented by corps medical units. The DISCOM has the capability to tailor sustainment support for the close fight through its FSBs that directly support maneuver brigades.

Personnel-services support for the division is managed by the G1 and supported by a DS corps PSC. Additional PSCs may augment nondivision units that support a division, depending on the unit size; or personnel-services support may be absorbed by the DS PSC.

While the DISCOM commander is the principal logistics executor within the division, the G4 has coordinating staff responsibility for planning CSS and establishing policies and priorities. Together, they ensure adequate and continuous support for division units. Support for nondivision units is provided by the corps support group that works both in and to the rear of the division sector. Integration of nondivision units into the division CSS structure is conducted through the DISCOM and the corps support group's LNO, normally located in the DISCOM CP.

The DISCOM DSB provides logistics support and health-services support to division units located in the division rear. Figure 6-8 shows an organization by area schematic of division and corps CSS units located in the DSA. The DISCOM DSB provides only reinforcing Class III(B) supply support and transportation support to FSBs and the DASB. The FSBs provide logistics support and health-services support to the units located in the maneuver brigade areas.



1. COSCOM units that provide support to division and corps units
2. Corps CSS units that provide support to division and corps units
3. COSCOM units that provide support to corps units operating in the division area
4. Division CSS units that provide support to division units
   NOTE: The medical company provides support to the division or the corps on an area basis.

Figure 6-8. CSS organizations in the division rear

FXXI CSS PLANNING PRINCIPLES

The following are planning principles that apply to both offensive and defensive actions. Sustainment planners and executors assist the commander in making the best use of available resources by following these key planning principles for any operation. Engineer commanders, their staffs, and key logistical personnel must understand and use these planning principles to assist them in maintaining proper logistical focus while planning CSS for engineer operations.

Anticipation

Anticipation of CSS requirements is made possible by the enhanced SA provided by secure communications and knowledge-based information systems. Sustainment planners accurately forecast future requirements and accumulate the assets needed to accommodate likely contingencies. Engineer operations feature high fuel-consumption rates, repair parts, construction and obstacle materials, mines, and explosives. They require a large commitment of maintenance and transportation services. Engineer operations require finance services to support the local purchase of materials and services. Planners must anticipate personnel losses, critical replacement requirements, and necessary health services support. Because forward engineer units will likely depend on the CSS system of their supported unit, engineer planners must anticipate changes in task organization that redirect the flow of engineer sustainment.

Integration

Tactical plans must have fully integrated CSS. This is crucial for the engineer contribution to the overall plan since material, personnel, and services must be available at the right time and place for engineers to properly execute their missions. The decrease in on-hand stockage levels greatly increases the engineer battalion's and its supporting BSC's dependence on EAD for resupply. This requires that CSS planners at the battalion and BSC support-operations level clearly identify all support requirements early in the planning cycle. This ensures that the required support is fully integrated into the engineer/brigade combat team (BCT) scheme of maneuver.

Continuity

Committed forces must receive continuous replacements, supplies, and services to maintain their fighting strength. Engineer units are always committed to either the current battle or the preparation for the next battle. They need a constant flow of supplies and services to remain effective and productive. Positive control of CSS assets should be enhanced through more accurate and timely reporting using FBCB2. Maneuver units often rely on lulls in the tempo of an operation to conduct CSS operations. Engineers are not routinely afforded the same opportunity since many logistics-intensive M/CM/S missions occur during lulls in the operation. This increases the engineer sustainment planner's responsibility to integrate continuous routine and emergency CSS operations into the tactical plan.

Responsiveness

The sustainment system must keep pace with rapid decision cycles and mission execution, and it must react rapidly to crises or opportunities. Responsiveness is the ability to meet changing requirements, often on short notice, as operations evolve in unexpected directions. The sustainment system must respond to the changing situation and the shifting of engineer units around the battlefield. Engineer sustainment planners must be particularly conscious of engineer task organization changes. When such changes occur, sustainment assets must be rapidly redirected to the receiving unit, making maximum use of the established division CSS structure. Since a unit can normally respond to a retasked organization much quicker than its support can, interim contingency sustainment plans must be developed to support retasked organizations.

Improvisation

Despite the best planning efforts, situations may arise in which resources will not be available to meet requirements as outlined in doctrine and support plans. Improvisation, innovation, and creativity may be necessary to provide continuous support. CSS organizations must improvise to meet current needs and respond to unforeseen emergencies.

SUPPORT OF OFFENSIVE OPERATIONS

In planning for the sustainment of offensive operations, the priority is to maintain the momentum of the attack. A successful attack may develop into an exploitation or a pursuit, and the CSS planners must be flexible enough to support either contingency. The following considerations apply to CSS planning for offensive operations in support of the digitized engineer battalion. Corps engineers will —

- Augment division engineers and provide additional mobility, countermobility, and survivability support.
- Position their engineer battalion administrative logistics operations center (ALOC) in either BSA or BFSA to facilitate coordination and synchronization with their supported maneuver brigade and supporting FSB elements.
- Specify the conditions when the automated medical evacuation (MEDEVAC) report arrives in casualty evacuation operations.
- Request the pre-position of high-use line replacement units (LRUs) forward with the engineer combat repair teams (CRTs).

A major product of the offensive planning process is the CSS overlay. The battalion S4 and/or HHC commander prepares both the traditional acetate overlay and an FBCB2 equivalent. When the FBCB2 operations overlay is received from the engineer company CPs, the BSC support operations officer, in coordination with the engineer battalion S4, enters the CSS graphics and control measures. These typically include locations of proposed support areas, primary and alternate MSRs, ambulance exchange points (AXPs), and supply points. Due to limitations inherent in the automated symbol set, the FBCB2 CSS overlay makes extensive use of checkpoints to represent supply points, AXPs, logistics release points (LRPs), and MSRs.

SUPPORT OF DEFENSIVE OPERATIONS

The two most critical periods for CSS operations in the defense is during the transition and preparation phases. The engineer battalions must make maximum use of limited visibility resupply to disguise friendly unit activity and to exploit the improved navigational capabilities and situational awareness of FBCB2 forces. Planning considerations for defensive operations are similar to those outlined for the offense, with the following additions. Corps engineers will —

- Sequence plan the need for mission loads.
- Anticipate the amounts and the engineer-specific types of ammunition; petroleum, oil, and lubricants (POL); and barrier material for delivery to centrally located LRPs and prestock locations.
- Anticipate and plan for increased transportation needs/cargo-carrying capacity that will be generated by engineers for Class IV/V supplies in the defense.
- Conduct resupply operations during periods of limited visibility to reduce opportunities for enemy interference.
- Use embedded diagnostics to troubleshoot and repair vehicles forward in designated positions. These measures include the self-test (ST), built-in test (BIT), and fault-isolation test (FIT) on the Grizzly, Wolverine, and Bradley engineer squad vehicle (BESV).

Planning considerations for developing an FBCB2 CSS overlay in support of the defense are similar to those discussed earlier for offensive operations. CSS overlays include locations of prestocks and routes to and from designated LRPs.

CSS UTILIZING ATCCS

CSSCS is the primary ATCCS CSS tool used by the division engineer at the DMAIN TAC MOB cell and within the DISCOM.

NOTE: A CSSCS box is located in the MOB cell at the DMAIN to provide the DIVEN with critical supply tracking information. The information provided below gives a general overview of the system's capabilities. More detailed

ATCCS information is provided in the CSSCS Commanders' Guide, March 1997.

CSSCS provides a concise picture of engineer unit requirements and support capabilities by collecting, processing, and displaying information on key items of supplies, services, and personnel that the commanders deem crucial to the success of an operation. CSSCS does not duplicate Standard Army Management Information System (STAMIS) functions. The management of all items within a class of supply or support function remains a STAMIS function. CSSCS tracks and provides critical engineer items managed by STAMIS.

CSSCS also supports the decision-making process with course of action (COA) analysis. Staffs can analyze up to three COAs for a four-day period. Variables include combat intensity, combat posture, unit task organization, miles traveled, and geographical region.

CSSCS maintains a database of unit personnel and equipment authorizations by standard requirement code (SRC) which is similar to tables of organization and equipment (TOE) and unit and equipment planning factors. CSSCS includes a database of equipment and personnel called a baseline resource item list (BRIL). The items that a commander identifies as critical to the operation can be selected from the BRIL to establish the commander's tracked items list (CTIL).

CSSCS currently provides SA of critical elements within personnel strength management and supply classes I, II, IIIB, III package (P), IV, V, VII, and VIII. Maintenance, transportation, and medical functionality will be added as the system matures.

CSSCS DATA COLLECTION

Unit supply status and requirements can be entered manually using standard input forms (screens) at the brigade S4, DSB, DASB, or FSB CSSCS terminal. Electronic interfaces to FBCB2 will greatly enhance the entry of unit data. CSSCS tracks unit information down to the company level.

Battle-loss SPOTREPs can be input to the CSSCS node at any level (brigade, division, or corps). Information is inputted either manually, in the case of Class III supplies, or by electronic transfer, when a STAMIS disk is downloaded into the CSSCS terminal. The CSSCS automatically updates the database.

The data is then distributed to other CSSCS nodes. The primary means of communication is mobile subscriber equipment (MSE). CSSCS nodes then manipulate the data through a series of algorithms that are based on Army planning factors, the specified task organization, and the established support relationships. This way, large quantities of data are presented in comprehensive, usable decision support information formats. This information is graphically portrayed to the commander through green, amber, red, and black bubble charts, SA, subordinate unit locations, and supply point status. Status may be projected out to four days using a combination of planning factors and manually generated estimates. Simplified color status can be further evaluated by the commander and his staff by accessing more detailed numerical data that supports the color status displayed.

At the maneuver-brigade level, two CSSCS devices (or nodes) will exist. One is located in the brigade S1 and S4 operational facility, and the other is in the support battalion support operations section. The brigade node is the point of entry in the CSSCS for all organizational-level CSS status reports and requirements of the brigade and its subordinate units. The brigade S1/S4 can also view the status of its supporting FSB/DASB and higher echelon supply points. Through interfaces to the other ATCCS systems, a CSSCS node provides the brigade S1/S4 with the battlefield RCP.

FSB, DASB, and DSB CSSCS nodes serve as entry points for some supply-point data that is not supported by STAMIS and all organizational status sent from their elements. The FSB, DASB, and DSB use CSSCS to —

- Track and anticipate customer logistic status and requirements.
- Track supply-point status and issues, receipts, and dues-in of CTIL items.

CSSCS INTERFACES

CSSCS connects to FBCB2 via LAN at the brigade S1/S4 level. FBCB2 will serve as a data source for CSSCS by passing aggregate data, a logistics situation report (LOGSITREP), and a personnel situation report (PERSITREP) that have been rolled up from the squad/section, the platoon, the company, and the company roll up by battalion. The LOGSITREP includes roll-ups of Classes I, III package (P), III (B), IV, V, VII, and VIII supplies. Class VII supply data also includes nonmission-capable information. CSSCS consolidates battalion data (up to 120 items) selected by the commander on the CTIL. CSSCS reports to higher headquarters and then provides lower echelons with the location of supply points via FBCB2. FBCB2 transmits personnel strength information by officer/warrant officer/enlisted through the PERSITREP. This information is rolled up from platform through battalion to brigade S1 where it may be entered directly into CSSCS or the force manning system (FMS) resident on the CSSCS. CSSCS uses this information to update its database on the personnel categories listed on the CTIL. CSSCS updates supply-point locations, whenever supply points move, in an electronic map overlay format and passes the location down to platform level via FBCB2.

SUPPLY OPERATIONS

Each engineer battalion has a large amount of equipment and requires frequent resupply to accomplish its mission. Through digitization and automation of reporting procedures, these resupply actions can now be accomplished with greater precision and speed. All leaders must make periodic checks to ensure that their equipment, especially high-use items, are accounted for and ready to use. They must anticipate expenditures and request supplies before an operation begins.

The engineer battalions receive their CSS from the BSC of their habitual FSB, located in their respective BSA. Within each BSC is an engineer support platoon that consists of fuel, food-service, and maintenance personnel dedicated to support the engineer battalion. CHS is provided by organic medics located in the engineer battalion HHC and by CLSs within the various engineer platoons. Priorities for delivery are established by the engineer company commander. The 1SG ensures the distribution of supplies within the company. The platoon sergeant (PSG) distributes supplies within the platoon.

There are specific CSS functions which must be accomplished in order to support the engineer battalion.

- **Manning**. This comprises personnel support activities which ensure that the commander has the personnel required to accomplish his mission. It includes management of personnel readiness, replacements, and casualties.
- **Arming**. This involves the activities necessary to provide ammunition for the battalion's weapon systems. Combat-configured loads (CCLs) are prepared for use during the initial stages of deployments. Thereafter, the battalion is sustained by ammunition packages configured for each weapon system based on the tactical situation; these are pushed as far forward as possible.
- **Fueling**. This includes meeting the total Class III supply requirements of the battalion.
- **Fixing**. This includes the functional areas of maintenance, the recovery of

equipment, and the repair and replacement of components.

- **Moving**. The CSS function of moving the battalion relates to assisting in the planning and executing movements of personnel, equipment, and supplies.
- **Sustaining the soldier.** These activities include—
  - — Personnel services support (PSS), including personnel and administrative services, chaplain activities, legal-services support, postal service, public affairs, enemy-prisoner-of-war (EPW) administration, and finance services.
  - — CHS, including preventive care, medical treatment, and MEDEVAC.
  - — Field-service support, including food preparation, laundry and bath, water purification, mortuary affairs, and airdrop operations.
  - — General supply support, including subsistence items, clothing (organizational clothing and individual equipment), water, POL, ammunition, barrier material, repair parts, and major end items.

FXXI SPECIAL CLASS IV/V SUPPLIES

These classes of supplies form the majority of the materials with which engineers construct the obstacles and fortifications required for the defense.

There are two types of Class IV/V loads: mission and basic. Mission loads consist of those materials required for a specific mission (for example, a standard fix minefield). Basic loads consist of those materials that the platoon carries to protect itself. The basic load can be used for missions to save time; however, it is to be replenished from the materials in the mission load. Basic loads are demand-supported and mission loads are throughput.

Mission loads are a task force TF responsibility regardless of the command and support relationships specified for engineers. The quantity of Class IV/V supplies (mines) normally stretches or exceeds the transportation assets of the task force and the FSB supply and transportation platoon. Pallatized standard loads/flat racks help solve the planning and distribution problem. Class IV/V resupply for the defense is one of the most demanding logistics operations the task force must carry out, and it requires all the assets that can be made available. A total cooperative effort by the task force, including engineers, is required if the defense is to be adequately resourced.

In the offense, task force planners anticipate Class IV/V mission loads for a hasty defense on the objective and send a digital status/ request through FBCB2 to the engineer battalion S4. Information copies are sent to the maneuver task force S4 and the BCT S4.

FXXI SUPPORT OPERATIONS

The two types of support operations are shown below. These operations include regular resupply of all classes of supply.

- **Mission support.** Mission support is designed for a specific maneuver operation. The designated engineer CSS elements conduct mission support to ensure that maximum engineer equipment is available to support the fight and that the specific operation is not hampered by a lack of supply support.
- **Continuous support.** Continuous support keeps the engineer equipment sustained over a period of time. It is conducted as close to the supported unit as practical.

CSS for engineer units supporting a division is divided in two basic categories — continuous support and mission support. Continuous support encompasses all of a unit's CSS requirements that are needed to remain a viable fighting force. Mission support consists of the supplies needed to accomplish specific engineer missions for the division. The flow of supplies and services in these categories differs and must be understood by engineer CSS planners and executors.

The requisition and delivery processes vary, based on the class of supply or the type of service. Continuous support, however, is generally accomplished through the DISCOM infrastructure to service forward engineer units. DIVEN units (regardless of their location in the division area) and corps engineer units supporting the close fight requisition and receive support through the DISCOM. Supply and services for nondivision engineer units working in the division rear area are normally requisitioned through the corps support battalions and corps personnel units supporting them. Mission support requires supplies, such as Class IV/V, that are used to install or breach obstacles both in the offense and defense. These supplies are requisitioned through the DISCOM for both division and nondivision engineer units. These supplies are normally moved from corps supply and ammunition companies by corps trucks as close to the obstacle locations as possible. This minimizes multiple material handling requirements, reduces the transportation requirements on division transportation assets, and facilitates a faster emplacement of the obstacles. If mission-required supplies cannot be delivered directly to obstacle locations or the engineer unit by corps transportation assets, a plan using division and task force transportation assets is required. Engineer units are equipped to augment this operation with limited transportation assets; but they are not responsible for planning, controlling, and executing the delivery of mission-required material.

Division engineers input continuous and mission support requirements early in the planning process at the DMAIN IIPC. Sound sustainment estimates, accurate tracking of engineer unit sustainment posture, and continuous coordination with the DISCOM ensure that requirements for engineer units are properly forecasted, prioritized, and delivered. This will assist engineer units in accomplishing their mission. Crucial to accomplishing these tasks are the responsibilities of the engineer organization's key CSS leaders and their functions within the division and engineer CP systems. All engineer commanders and their staffs supporting a division's fight must be familiar with and support these roles and functions in order to ensure appropriate unit and mission sustainment of the engineer force.

FXXI IMMEDIATE RESUPPLY

Immediate resupply, normally involving Classes III(B), IV, and V supplies, is executed when an engineer element has an urgent need for resupply that cannot wait for the routine LOGPAC. Immediate supply procedures start with the redistribution of supplies; for example, the redistribution of ammunition in individual vehicles followed by cross-leveling of ammunition within the platoon.

The commander or 1SG transmits a "call for support" for Class III/IV/V supplies through FBCB2 to the support operations section of the engineer support element. Immediate supplies are brought forward by the supply and transportation (S&T) platoon of the engineer support element. Based on the enemy situation, the platoon may conduct resupply while in contact with the enemy. Two techniques are used to resupply platoons in contact — tailgate and service station.

FXXI ENGINEER CSS LAYDOWN

Logistics support, health-services support, and personnel-services support for engineer units supporting a division depends on the unit's location on the battlefield and their command support relationship to the division. In terms of CSS planning and coordination, engineer units fall into three types:

- Division engineer units assigned to maneuver brigades. These engineer units supporting maneuver brigades in close operations receive their logistics support and health-services support from their engineer support element located in the engineer support area (ESA). These same division engineer units may also be tasked with division support missions. For example, the maneuver brigade designated as the division reserve may have some or all of its engineer assets diverted by division for a high-priority mission such as building protective berms for fuel blivets or improving an airstrip in the division rear. When performing this type of division support mission the engineer units are still supported by their habitual FSB.
- Engineer units from EAD attached to the division. These engineer units receive CSS support from the supported unit, normally divisional FSBs augmented by corps CSS assets. The FSBs provide logistics support and health-services support to these nondivision engineer units that are attached and supporting the division in close operations.

NOTE: Recent divisional logistics restructuring and the incorporation of a distribution-based supply system has left the division logistically lean. When engineer EAD units are attached to the division, division and corps staffs coordinate for corps support packages to be pushed to the division and augment CSS support because of the division's limited capability to support attached units.

- Engineer units from EAD that are OPCON, DS, or GS to the division and performing missions in the division AO. Special support packages from the corps support group are tailored and sent to the DSA/BSA to support these nondivision engineer units that are in support of the division. The corps support group LNO, collocated with the DISCOM CP, assists in the CSS coordination for these EAD engineer units located in the ESA or the BFSA.

Regardless of the command or support relationship and the location on the battlefield, all engineer units operating in the division's area must provide routine CSS status reports through the appropriate headquarters to ensure that the CSS of engineer units and missions is fully integrated into the division's planning and coordination of sustainment support. EAD engineer units provide their own CSS for special low-density requirements through their organic S4's in their organizations. EAD engineer units will provide CSS status reports through their organic S4's.

FXXI DIVISION ENGINEER ROLE IN PLANNING AND COORDINATING CSS

The efforts of the division engineer and his DSES to plan and coordinate engineer CSS are essential to the full integration of engineer units into the division's sustainment structure. At the DMAIN, the ADE is the principal staff officer in charge of the DSES. The ADE is located in the division MOB cell and works closely with the DISCOM and G4 who are collocated at the division sustainment cell to synchronize planning and coordination and to facilitate timely engineer sustainment support.

Upon receipt of the WARNORD for a mission, the DSES in the DMAIN, assisted by a corps engineer group or battalion engineer S4 representative, immediately initiates the CSS estimate process as outlined in FM 101-10-1/2. These estimates are specifically focused on the sustainment of all subordinate engineer units organic or attached to the division. Class III, IV, V, and VII supplies and personnel losses are the essential elements in the estimate process. The MCS-ENG that is tied to the CSSCS links the DSES with the DISCOM. During continuous operations, this link simplifies and speeds the estimate process, which provides the DSES with the visibility of critical engineer support requirements. Aggressively maintaining an accurate combat status of all engineer units is critical to shortening the CSS estimate process. Personnel and logistics are also tracked to coordinate critical requirements with the DISCOM and G4. The DSES at the DMAIN maintains a current status of engineer force CSS by conventional means in case the digital network becomes nonoperational.

Having conducted the estimate process to determine the unit sustainment and mission supply requirements, the DMAIN engineer compares the requirements with the reported status of subordinate units to determine specific amounts of supplies needed to support the operation. These requirements are then coordinated with the DISCOM to ensure that necessary supplies are identified and resourced through division or corps stocks.

The DSES develops a recommendation to support engineer mission requirements and forwards it to the DISCOM/G4 and CSES. Based on the division's current stockage of required items and the identification of additional supplies needed, the ADE, in coordination with the G4, assesses the availability of these supplies in corps stocks. The ADE and the engineer group's S4, in coordination with the G4, also analyze the division's capability to transport mission supplies to the user.

Having identified the requirements and availability for unit sustainment and engineer mission supplies, the requirements and a projected combat power status are forwarded to the ADE based on current engineer sustainment operations. The DSES then analyzes the requirements to support the plan and translates them into specific plans that are used to determine the supportability of the division's COAs. Upon determination of a COA, the specific CSS input to the division's basic order and paragraph 4 of the engineer annex is developed and incorporated into the order. Current sustainment operations may require redirection based on the new plan and will be sent to the division engineer for coordination and execution. The division engineer also has essential CSS tasks involving nondivision engineer units. First, the division engineer at the DMAIN monitors the sustainment status of nondivision engineer units. Nondivision engineer unit commanders and their staffs must support this requirement. Nondivision engineers can report over MCS and/or CSSCS (if available), or they can provide the current status via tactical satellite (TACSAT) FM voice or an LNO team. Accurate and timely status reporting will assist the division engineer in providing accurate engineer status to the division commander and will energize the DSES to intercede in critical sustainment problems where necessary. The DSES also ensures that mission required supplies needed by nondivision engineer units to execute missions for the division are integrated into the division's CSS plans. Accurate and timely reporting and close coordination between the DSES and supporting nondivision engineers is essential for proper execution of the mission.

APPENDIX A

ENGINEER ESTIMATE

The engineer estimate is an extension of the command estimate procedure. It is a logical thought process that is conducted by the engineer staff officer concurrently with the supported maneuver force's tactical planning process. The engineer estimate process—

- Generates early integration of the engineer plan into the combined arms planning process.
- Drives the coordination between the staff engineer, the supported commander, and other staff officers.
- Drives the development of detailed engineer plans, orders, and annexes.

Each step of the engineer estimate process corresponds to a step of the command estimate procedure. Like the command estimate, the engineer estimate is continuously refined. Table A-1 shows the relationship between these two estimates. A more detailed discussion of each step of the engineer estimate process is found below. The command estimate procedure provides the framework for discussion of the corresponding engineer estimate actions.

In the FXXI division, the engineer-estimate process is enabled by digital systems. ABCS interoperability improvements have enhanced the commanders' and staffs' ability to share large amounts of intelligence and planning information. This can compress the decision-making cycle, abbreviate the deliberate decision-making process, and modify COA selection. For example, enhanced SA and the ability to receive or "pull" information from ABCS databases and cooperatively share that information can lead to earlier COA development and decisions.

NOTE: Experimental force (EXFOR) commanders and staffs participating in the advanced warfighter experiments (AWEs) validated this emerging process.

The ability to condense portions of the MDMP also impacts future battle planners. Since decisions may be arrived at somewhat earlier, planners must constantly maintain SA and a RCP equal to that of the current battle planner. The future battle planner must be able to anticipate the subtlest change in the tactical situation. As he sees the tactical changes unfold he must make corresponding adjustments that foster a smooth transition from one plan of action to another without interruption to the desired OPTEMPO.

Table A-1. Command and engineer estimates

COMMAND ESTIMATE	ENGINEER ESTIMATE
Mission	Mission
Facts and Assumptions	IPB/EBA
Mission Analysis	Engineer Mission Analysis
Commander's Guidance	Develop Scheme of Engineer Operations
Develop Courses of Action	War-game and Refine Engineer Plan
Analyze Courses of Action	Recommend a Course of Action
Decision	Finalize the Engineer Plan
Actions and Orders	Issue Orders

Receiving the Mission

The staff engineer quickly focuses on several essential components of the basic order and engineer annex when he receives the mission. These are—

- The enemy situation.
- The mission paragraph.
- The task organization.
- The logistics paragraph.
- The engineer annex.

From these components, he determines—

- The type of operation (offensive or defensive).
- The current intelligence picture.
- The assets available.
- The time available (estimate).

Facts and Assumptions

Developing and refining facts and assumptions is a continuous process. The maneuver commander relies on the staff to present him with facts and assumptions on which he can base his mission analysis, restated mission, and course-of-action development. Facts and assumptions pertain to the enemy as well as the friendly situation. The staff engineer uses the EBA as the framework for developing facts and assumptions.

Engineer Battlefield Assessment

The EBA consists of three parts (see Table A-2):

- Terrain analysis.
- Enemy mission and M/S capabilities.
- Friendly M/S capabilities.

Terrain Analysis. Terrain analysis is a major component of the IPB. The objective of the terrain analysis is to determine the impact that the terrain (including weather) will have on mission accomplishment. The staff engineer supports the intelligence officer in this process. Normally, using the OCOKA framework (see Table A-3), they determine what advantages or disadvantages the terrain and anticipated weather offers to both enemy and friendly forces. This process has direct impact on planning engineer operations. See Table A-4, page A-4, for examples of how the components of OCOKA may impact engineer support.

Enemy Mission and M/S Capabilities. Threat analysis and threat integration are also major components of the IPB. Enemy mission and engineer capability is a subcomponent of the threat analysis and integration process. The staff engineer supports the intelligence officer during the threat evaluation by focusing on the enemy's mission as it relates to enemy engineer capability. When executing this component of the EBA, the staff engineer must first understand the enemy's anticipated mission (attack or defend) and consider how enemy

- Prepares to assume the duties of the DIVEN MAIN, if necessary; duplicates DIVEN MAIN battle tracking.
- Provides detailed engineer CSS input to the DIVEN MAIN for inclusion in division plans.
- Coordinates unit and mission CSS issues with the G4 and DISCOM for DIVEN subordinate units working in the division rear area.
- Is responsible for all duties of the logistics officer, as outlined in FM 101-5.
- Integrates engineer CSS activities into the division CSS system.
- Provides detailed engineer CSS input to the DIVEN MAIN CP for inclusion in engineer unit orders.
- Synchronizes the execution of all logistics functions for engineer units operating in the division AO.

ADE

Division Staff Responsibilities. The ADE is the division engineer's primary point of contact (POC) on functional matters with division plans and current operations cells. He performs his functional responsibilities on behalf of the DIVEN. The ADE—

- Is the OIC of the assistant division engineer section.
- Tracks all mobility, countermobility, survivability (M/CM/S) and sustainment engineer aspects of the deep, close, and rear battle through close coordination with the DIVEN division TAC and REAR CPs engineers.
- Assists the division main CP's current operations element and synchronizes engineer support to the current close and rear fights.
- Coordinates closely with the G2, G3, and division main CP's plans element to ensure engineer integration into future operations.
- Develops scheme of engineer operations for future deep, close, and rear operations.
- Allocates engineer resources for deep, close, and rear operations; recommends the engineer task organization.
- Synchronizes and integrates engineers into the division plan and unit-level division scheme of engineer operations.
- Prepares engineer input into the division's basic order and engineer annex.
- Processes engineer requirements identified by the division TAC and rear CPs; resolves conflicts and integrates into future plans.
- Coordinates engineer functions with adjacent divisions and the higher engineer headquarters staff engineer; maintains a data base to facilitate the transfer of information.
- Receives, posts, and analyzes combat intelligence, focusing on its impact on future plans.
- Interfaces with corps engineer on corps engineer plans, statuses of division engineer missions, and the identification of division requirements for corps engineer assets.

The FXXI Division and Staff

FXXI key engineer personnel in the division HQ are organized under a special DIVEN staff engineer section (SES) or DSES. This section operates out of the DMAIN and the DTAC. This DSES performs all duties and responsibilities necessary to manage and control the engineer forces supporting the division. Table C-1 lists the personnel in the DSES. Tables C-2 and C-3 outline the positions and composition of the DSES that operate out of the engineer MOB cells located at the DMAIN and DTAC.

Table C-1. DIVEN

Organization/Composition	
Rank	**Authorized**
Colonel	1
Major	3
Captain	8
Sergeant major	1
Master sergeant	2
Sergeant first class	3
Staff sergeant	2
Sergeant	2
E1-E4	6
Total	28

Table C-2. DMAIN MOB/survivability cell

DMAIN MOB/SURVIVABILITY CELL		
Rank	**Position**	**Authorization**
Colonel	Division engineer	1
Major	ADE	1
Major	Plans officer	1
Captain	Assistant plans officer	1
Captain	Operations officer	2
Captain	Intelligence/targeting officer	2
Captain	Engineer project management officer	1
Sergeant major	Sergeant major	1
Master sergeant	Combat construction foreman	1
Sergeant first class	Intelligence/targeting NCO	2
Sergeant	Technical engineer sergeant	1
Sergeant	Topographic sergeant	1
Specialist	Topographic analyst	2
Private first class	Wheeled vehicle driver	2

Table C-3. DTAC MOB cell

DTAC MOB Cell		
Rank	**Position**	**Authorization**
Major	Operations officer	1
Captain	Assistant operations officer	2
Master sergeant	Operations sergeant	1
Sergeant first class	Operations sergeant	1
Staff sergeant	Reconnaissance sergeant	1
Staff sergeant	Mobility/countermobilty/survivability NCO	1
Private first class	Wheeled vehicle driver	1
Private first class	Tracked vehicle driver	1

FXXI Leader Duties and Responsibilities

The following paragraphs discuss the primary duties and responsibilities of the FXXI division engineer and key personnel conducting engineer staff operations at the DMAIN and DTAC:

Division Engineer

The division engineer, as the senior engineer of the division, serves as the primary advisor to the division commander on engineer employment. In this capacity, he—

- Plans and controls the following engineer battlefield functions:

  —Mobility.

  —Countermobility.

  —Survivability.

  —General engineering.

  —Topographic engineering.

- Formulates concepts for engineer support.
- Advises the commander on the employment and reduction of obstacles.
- Provides recommendations related to engineer priorities and acceptable risks.
- Formulates and recommends engineer task organizations to support mission requirements.
- Produces maps and terrain products that facilitate terrain and battle-space visualization.
- Plans and coordinates with the FSCOORD on the use and application of artillery-delivered SCATMINES.
- Assists in the IPB process.
- Ensures that engineer plans and actions are properly coordinated, integrated, and synchronized with all division plans and operations.

The division engineer also controls all organic, attached, and engineer forces placed in OPCON to the division. In this capacity he and his staff will—

- Prepare and disseminate, via digital or manual means, operational plans, orders, and overlays to ensure that SA and a RCP is maintained at all command levels relevant to division and DIVEN operations.
- Assign specific missions to organic, attached, and OPCON engineer elements under their direct control.
- Analyze unit performance and provide advice and assistance to subordinate commanders of the DIVEN battalions, as required.
- Monitor current engineer operations, anticipate future requirements, coordinate resources, and shift priorities as needed to support division and maneuver brigade operations.

NOTE: During tactical operations, the division engineer will position himself where he can best monitor tactical events and exercise control over DIVEN operations. During planning, he may choose to conduct operations from the DMAIN, where he may best oversee and direct planning operations. Conversely, he may operate from the DTAC during the close fight, where he can provide on-site presence and assistance to the command group. The division engineer will use the MCS, BVTC, and voice systems during execution of his duties.

DMAIN MOB and Survivability Cell

ADE. The ADE is second in command; and in the absence of the division engineer, he performs all functional responsibilities on his behalf. The ADE—

- Serves as the officer in charge (OIC) of the MOB and survivability cell.
- Synchronizes and focuses staff planning for deep, close, and rear operations.

- Coordinates with the G6 to ensure that communications connectivity and interoperability is maintained between the ADE cell and the DTAC MOB cell, SSOC, the corps engineer element, and CSES.
- Supervises/oversees the development and dissemination of the orders process.
- Ensures that the staff maintains routine, day-to-day coordination and information exchanges with all DMAIN and corps staff elements via face-to-face coordination or digital links.

NOTE: During tactical operations, the ADE will normally monitor tactical events and exercise control over staff operations from the DMAIN. However, as the division engineer directs, the ADE may position himself at the DTAC, allowing the division engineer to move to other locations as the tactical situation dictates. The ADE will use the MCS, DTSS, VTC, and voice systems during execution of his duties.

Plans Officer. The plans officer is the primary planner on the DSES and is positioned in the DMAIN IIPC. He maintains a close working interface with the DMAIN sustainment cell, the targeting-and-fires cells, and the G3 plans-and-operations cell during the execution of current operations and while planning for future operations on a day-to-day basis. The plans officer provides advice and assistance related to engineer operations. Therefore, he requires maturity and experience in engineer operations and an in-depth knowledge of engineer tactics, engineer doctrine, and the uses of engineer digital systems, equipment, and resources. He—

- Receives, reviews, and conducts analysis of intelligence information and products to determine friendly and enemy engineer considerations having impact on future operations.
- Maintains SA and a RCP through the establishment of techniques and procedures that will ensure a continuous flow of two-way information with the DTAC via the digital or manual exchange of information and information products.
- Ensures the timely sharing and/or dissemination of critical information to the staff and subordinate command levels who require/need the information to conduct planning, execute actions, or effect tactical decision-making.
- Ensures that the engineer scheme of maneuver is synchronized and integrated with division and maneuver brigade battle plans.
- Develops engineer contingency plans and scheme of engineer operations in support of deep, close, and rear support operations and coordinates logistical and other sustainment requirements identified by G4 representatives.
- Develops and recommends engineer task organizations and allocates resources.
- Provides engineer input to the division OPORD and prepares the engineer annex.

Assistant Plans Officer. The assistant plans officer—

- Assists the plans officer in the synchronization of tactical operations with all division staff sections.
- Sustains and maintains SA and a RCP through the maintenance of databases, and upgrades/disseminates critical engineer information and overlays.
- Maintains ongoing coordination and cross talk with the DTAC and the SSOC via MCS, BVTC, and voice systems.
- Interfaces and coordinates engineer missions, taskings, and schemes of operation with higher, adjacent, and

subordinate headquarters staff engineers.

- Performs all duties/responsibilities of the plans officer in his absence.
- Reviews plans and orders of subordinate engineer units.
- Assists the plans officer in the review of OPLANs and OPORDs for engineer synchronization and completeness.
- Performs other duties as assigned by the ADE, such as coordinating with the engineer LNO cell and terrain-analysis cell.

Operations Officer. The operations officer—

- Provides information on the status of engineer assets and resources on hand.
- Monitors and tracks all M/CM/S and sustainment missions performed in support of deep, close, and rear operations.
- Determines engineer CSS resource requirements through digital or verbal reports submitted from subordinate engineer units.
- Coordinates engineer logistical requirements with the G1/G4 to ensure that resources are properly positioned at the right time and location to support engineer operations.
- Ensures that necessary sustainment support requirements are provided when and where required.
- Recommends the use of resources to accomplish engineer support, including resources required for deception operations.
- Provides recommendation to the plans officer during the task organization process and mission assignment.

Intelligence/Targeting Officer. The intelligence/targeting officer—

- Assists the G2 in development of the IPB by providing analysis of enemy engineer capabilities and limitations.
- Gathers, coordinates, evaluates, analyzes, and disseminates intelligence data to subordinate engineer units to maintain/update SA and RCP.
- Describes the effects of terrain and weather on friendly and enemy capabilities.
- Evaluates the enemy engineer threat, doctrine, order of battle factors, HVT, capabilities, and weaknesses.
- Plans Raptor ICO intelligence and target acquisition activities with G3, G2, and targeting-and-fires cell.
- Participates in targeting-and-fires cell meetings regarding the use/application of SCATMINES and Raptor ICO and provides terrain information/products that aid terrain visualization and/or use.
- Provides the plans officer and the terrain analyst with guidance/information related to the enemy's most probable and most dangerous COA and key events.
- Conducts a roll up of all subordinate element and DIVEN PIR/IR and ensures that they are coordinated with the G2 through the G3.
- Analyzes enemy in concert with the G2, capability to use natural and other man-made obstacles to impede friendly forces or jeopardize long-term objectives.

Engineer Project Management Officer. The engineer project management officer—

- Performs all duties/responsibilities of the operations officer in his absence.
- Reviews project tasks, identifies requirements and resources required to accomplish project tasks, and projects completion estimates.

- Establishes construction schedules, synchronizes/coordinates requirements, establishes construction timelines, and sets priorities.
- Monitors construction projects during execution and executes all quality control, standards of compliance, and safety checks.

Combat Construction Foreman. The construction foreman—

- Acts as the engineer project management officer in his absence.
- Acts as the engineer project management officer's primary technical advisor and assistant during the planning and execution of construction projects.
- Reviews all technical aspects of construction plans to ensure compliance with current codes and/or technical specifications.
- Serves as a technical advisor and LNO to engineer elements during general construction operations.
- Inspects work progress and enforces job specifications and safety standards.
- Supervises teams of construction and demolitions personnel.

Intelligence/Targeting NCO. The intelligence targeting NCO—

- Performs all duties of the intelligence and targeting officer in his absence.
- Provides assistance to the intelligence/targeting officer in the following areas:
  - —Maintains a log of intelligence reports submitted by subordinate elements.
  - —Shares/coordinates engineer intelligence and targeting information with the G2 and targeting-and-fires cell.
  - —Maintains a current intelligence enemy and friendly database.
  - —Maintains a record of all PIR/IR submitted.
  - —Ensures answers to requirements are forwarded to the requester and others in a timely manner.

Technical Engineer Sergeant. The technical engineer sergeant—

- Prepares digital overlays that portray all mobility and countermobility graphics and restrictions in the zone.
- Maintains a cell operations journal and journal files.
- Assists in the planning of offensive, defensive, and other operations.

Topographic Sergeant. The topographic sergeant—

- Produces map and terrain products and coordinates with the G2 for planning and distribution.
- Provides terrain-vizualization mission folders to determine the terrain's effects on both friendly and enemy operations.
- Recommends MSRs and logistics areas to the G4 based on terrain analysis and a review of topographic map data.
- Provides terrain and weather analysis to the engineer plans officer, intelligence section, and other staff officers, as required, to support IPB development or complement other ongoing planning.
- Procures ABCS digital maps and ensures that they are updated and reflect the current AO.

DTAC MOB Cell

The DTAC MOB cell is comprised of the following personnel:

Operations Officer. The operations officer—

- Works closely with G6 representatives to ensure that communications (digital and voice) interoperability and connectivity are maintained with the DMAIN MOB-and-survivability cell.

- Monitors and tracks all M/CM/S and sustainment missions performed in support of deep, close, and rear operations.
- Determines CSS resource requirements through coordination with the subordinate engineer units.
- Ensures that necessary sustainment support requirements are provided when and where required.
- Provides information on the status of engineer assets and resources on hand.
- Recommends the use of resources to accomplish engineer support, including resources required for deception operations.
- Disseminates and shares intelligence and targeting information with the ACE forward and FSE cell.
- Gathers, coordinates, evaluates, analyzes, and disseminates intelligence data to subordinate engineer units to maintain/update SA and RCP.
- Evaluates the enemy engineer threat, doctrine, order of battle factors, HVTs, capabilities, and weaknesses.
- Plans Raptor ICO intelligence and target-acquisition activities with G3, ACE forward, and FSE.
- Participates in targeting-and-fires cell meetings regarding the use/application of SCATMINES and Raptor ICO.

Assistant Operations Officer. The assistant operations officer—

- Performs all duties/responsibilities of the plans officer in his absence.
- Reviews plans and orders of subordinate engineer units.
- Assists the plans officer in the review of OPLANs and OPORDs for engineer synchronization and completeness.
- Assists the plans officer in the synchronization of tactical operations with all division staff sections.

Operations Sergeant. The operations sergeant—

- Prepares digital overlays that portray all mobility and countermobilty graphics and restrictions in the zone.
- Maintains a cell operations journal and journal files.
- Assists in the planning of offensive, defensive, and other operations.
- Prepares, maintains, and briefs topographic products to the commander as required.

Reconnaissance Sergeant. The reconnaissance sergeant—

- Screens and analyzes intelligence summaries (INTSUMs) and intelligence reports (INTREPs) to determine relevant information related to enemy actions/activities and their impact on current or future friendly engineer operations.
- Maintains a close working interface with the topographic section for the acquisition of terrain products or information that facilitate R&S operations and define enemy obstacle data.
- Reviews the division R&S plan to ensure that engineer reconnaissance teams are properly tasked and capable of completing assigned missions.
- Coordinates technical intelligence collection activities and digital and manual techniques and procedures for the dissemination of information.
- Coordinates with the chemical officer to analyze the enemy's capability and predictability of using weapons of mass destruction.
- Coordinates ground and aerial reconnaissance (UAV/ASTAMIDS) and surveillance operations with other collection assets.

M/CM/S NCO. The M/CM/S NCO performs the same duties as the technical engineer sergeant in the DMAIN MOB and survivability cell (see page C-11).

APPENDIX D

INFORMATION ACQUISITION, MANAGEMENT, AND REPORTING

The high performance of a unit is due, in large part, to their ability to effectively acquire and use timely and relevant information. This is often accomplished by supplementing the routine information flow by—

- Going outside the traditional information channels.
- Using SOF units, reconnaissance teams, and special communication networks.

These techniques remain valid; however, modern technology potentially makes the advantages gained almost routine. Technological advances made in sensors, processors, communications, and computers give the division engineer and maneuver commanders immediate access to large volumes of operational and terrain information. These advances in technology better support leaders through a deliberate and systematic information process based on building blocks of raw data that is passed and collated by both man and machine, synthesized into a coherent whole, and focused on drawing understanding. By linking commanders and staffs at different command echelons, this same technology enhances the development and maintenance of SA and promotes synchronized operational planning and execution.

Situational Awareness

SA includes—

- A common understanding of the commander's assessment of the situation.
- The commander's intent.
- The commander's concept of the operation, combined with a clear picture of friendly and enemy force dispositions and capabilities.
- A comprehensive understanding of the impact of terrain on the operation.

The commander's assessment of the situation, his intent, and his concept of the operation provide the common framework that fosters cohesion and unity of effort during the execution of operations and leads to enhanced SA and development of the RCP. SA is inherently local. The local situation relevant to each level and individual is developed within the common framework and subsequently shared vertically and laterally. As the information is subsequently compiled, collated, and disseminated at each command level, commanders, staffs, and soldiers begin to develop a more complete and informed picture of the battle space.

Information Activities

Information activities include—

- Acquiring.
- Using.
- Protecting.
- Exploiting.
- Denying.

- Managing.

When effectively executed, these critical activities supplement the human skills of battle command, speed decision-making, minimize or eliminate uncertainty, focus combat power, help protect the force, harness organizational capabilities, and enhance SA for soldiers and leaders. These activities apply to both information and systems (hardware, people, organizations, and processes).

Necessary information includes not only the METT-T but the who, what, when, where, how, and why questions. The value of that information is effected by its *accuracy, timeliness*, and *relevance* to the situation in consonance with the commander's critical information requirements (CCIR). Considering the available information sources and the nature of the information produced, the commander and his staff will develop both technical and tactical plans to acquire information. Information may be acquired by organic personnel; technical means; intelligence collection systems; tactical reporting; and intelligence or information disseminated from national, strategic, and tactical sources or agencies.

Commanders determine their critical information requirements for each operation and publish those requirements through the CCIR. The staff may recommend CCIR to the commander as—

- Priority intelligence requirements (PIR).
- Friendly force information requirements (FFIR).
- Essential elements of friendly information (EEFI).

Information is perishable and of little value beyond a certain time period. For example, events can make an item of information irrelevant or so unrepresentative as to portray a highly inaccurate picture of reality. Information beyond a certain age will detract from the commander's SA. SOPs, CCIR, OPLANs, and collection plans must all be sensitive to the perishability of information. Information managers must respond by managing information to enable assured, timely communication and decision-making.

Use

The division commander and the G2 use all available space, air, and ground systems to acquire relevant information and develop a current situation. It is important to note the importance of *relevance*. Not all information is relevant to the situation at hand. Relevant information applies to that information that will assist in answering the CCIR or enabling the commander's tactical decision-making. The horizontal internetting of the division's digital systems will provide (when properly leveraged and focused) a multidimensional picture. Once the information acquired through this network is analyzed and fused, the information is disseminated vertically and laterally to update and validate a common SA. This common SA provides the basis to refine, continue, or adjust decisions, plans, and operations.

Protect

Simply put, as part of planning, the G6 must conduct an analysis of the division's information structure to prioritize critical paths, systems, and data for protection. The G3 must perform risk-management analysis to identify essential information and information systems that must be kept free from disruption or corruption.

Exploit

At division level, exploitation may extend to the command's ability to—

- Intercept communications.
- Read enemy signals.
- Analyze electronic signatures.
- Establish enemy OB.
- Extract information from EPW, detainees, and friendly sources.

Deny

At division level, the goal is to attack an enemy throughout the depth of the battle space in order to degrade confidence in his data related to friendly operations or his ability to execute C2 of his operations. To blind the enemy, the division commander must either influence or engage the enemy's major surveillance and reconnaissance systems. Conversely, the division must deny the enemy the same opportunities. Enemy space-based systems and UAVs will be focused on finding and tracking friendly units and movement. These R&S platforms will be difficult to locate, much less attack. Therefore, the division commander and his subordinate commanders may be forced to use traditional means such as camouflage and deception to deny access to friendly information.

Manage

Operations using digital systems enable the acquisition of information from multiple national, strategic, or tactical sources. Once acquired, this mountain of data must be quickly translated into knowledge and understanding.

Accomplishing this challenge requires a continuous and cyclical process. Decision-making has become increasingly dynamic and multidimensional. For example, with the advent of digital information systems and sensors, the commander and his staff can now develop real- or near-real-time information in all three dimensions of their battle space, increasing operational tempos. Therefore, decisions about current operations must occur simultaneously with decisions and planning about future operations. Decision-making must, at a minimum, maintain pace with each change in SA that has an overriding objective to get inside the enemy commander's decision cycle.

The information technologies of today permit the horizontal and lateral movement and integration of information that provide a framework for tactical decision-making. This potentially allows an increased span of control without a corresponding loss in effectiveness. This is critical in that the modern battlefield will increase the separation between units, creating sizeable gaps between formations. This dispersion creates more subordinate-force clusters, decentralized decision authority, and a major requirement for coordinated effort.

Harnessing the potential of information is a critical task for the staff of a digitally equipped unit and will require a transformation in the way business is routinely accomplished and will require thinking "outside the box." Technology alone will not provide leaders and staffs with automatic battlefield visualization, flawless SA, easily expanded vision, or highly effective information management. As stated earlier, this is a *man/machine process*. Therefore, commanders and staffs must learn how to leverage their information systems as well as effectively manage and control the products produced or exchanged through those systems. This means that commanders and staffs must closely examine habitual working relationships and information flows to ensure that the right information is getting to the right person at the right time.

The Information Manager

In order to conduct full-dimension operations, information and information systems require careful coordination, synchronization, and integration. With guidance issued, the staff coordinates and integrates information requirements. The information manager synchronizes the critical information flow with the operational concept.

NOTE: The information manager at division level is normally the chief of staff. However, each staff cell must appoint an information manager who is accountable for the acquisition, storage, han-

dling, control, and dissemination of information.

The management of information and information systems must focus on operational requirements that will derive information from R&S, counterreconnaissance, communication, and security operations. Managing information entails—

- Deciding what sources and systems to use.
- Ensuring a reliable flow of information between cells and command levels.
- Resolving differences in information from multiple sources.

Effective management of information and assets ensures a continuous and uninterrupted horizontal, vertical, and lateral flow of information across BOSs to enable effective planning, decision-making, and execution. The key to effective communication and information flow in a digitally equipped unit is throughput and connectivity. The G6 is integral to this process.

NOTE: When dealing with forces or units less technically capable, teams must be prepared to deploy with specialists or liaison personnel who are equipped with updated equipment.

Engineer Reports

The following paragraphs address operational and logistical reports that are routinely used in DIVEN units. Report examples address the purpose of each report, how often and by what means each report is submitted, and identifies the engineer echelon that normally submits the report.

Engineer Operational Reports

Engineer companies supporting the division's maneuver brigades provide operational reports to convey the status of work. The reports are normally transmitted through maneuver channels using the FBCB2 to their battalion headquarters, with a copy furnished to the supported unit. The engineer battalion will forward this information through engineer channels using the MCS.

NOTE: Engineer reports will normally conform to the formats established by the corps/JTF SOP.

Engineer Logistics Reports

Logistics requirements for engineer companies providing support to the division's maneuver brigade are provided to the supported unit's first sergeant. The engineer company/team prepares and submits a LOGSITREP to his battalion S4 via FBCB2, with a courtesy copy provided to the maneuver brigade S4 and FSB support operations. This is only an alert and provides a forecast of engineer requirements. It should not be acted on. The engineer battalion S4 then consolidates all company LOGSITREPs and provides a company roll-up LOGSITREP to the maneuver brigade S4 and FSB support operations using FBCB2.

Report Types

There are two types of operational and logistical reports: routine and event-driven. Routine reports are submitted as part of normal operations as required by higher headquarters or an SOP. Event-driven reports are submitted as a result of an event occurring (for example, friendly forces making contact with enemy forces, upgrade of a lane in an obstacle system from one-way to two-way traffic, and observation of enemy activities). The following paragraphs show examples of routine and event-driven reports. It is important that each engineer CP disseminates pertinent information contained in reports to their corresponding supported maneuver unit.

NOTE: Technical problems continue to be resolved regarding the ability of the MCS operator to digitally exchange/ transmit engineer reports, particularly those reports containing a large amount of graphical content. Until these problems are resolved, engineer units equipped with MCS must develop "work-arounds" that consist of a mix of digital and manual procedures.

Routine Reports

Prior to conflict, reports are normally sent via the ABCS, MCS, or tactical facsimile. However, after contact is made, reports will normally be submitted by voice, and followed up with a digital report or FBCB2 when time permits.

NOTE: The automated capabilities of MCS allow the operator to prepare unit-designed formats, which can be added to the standard report template.

Commander's SITREP. This report shows changes to a unit's tactical situation and status.

Sensitive items report (SENSREP). This report shows the status of the accountability of sensitive items.

Supply status report (SUPREP). This report informs the commander and his staff of the subordinate units' supply status. It normally includes Classes I, III, IV, V, VIII, and IX (critical shortages) supplies.

Personnel status report (PERSTATREP). This report renders accountability and status of assigned and attached personnel and generates requests for replacements.

DA Forms 2404 and 2406. These forms provide information on the operational status of equipment and generate requests for maintenance and parts.

Event-Driven Reports

Event-driven reports are submitted as a result of an event occurring. As with routine reports, digital means are normally used to send reports prior to conflict and voice with a digital followup are used after contact.

Reconnaissance report. These reports collect technical and tactical engineer data on a point, area, or route such as a bridge, overpass, culvert, and route trafficability.

Countermobility report (CMREP). This report shows the status of obstacles. It may include other reports, such as reports of intention, initiation, completion, progress, transfer, and change.

Mobility report (MOBREP). This report shows the status of lanes, routes, bypasses, crossing sites, and LOCs. It includes status changes and upgrades or downgrades of trafficability in reconnoitered locations.

Survivability report (SURVREP). This report provides detailed information on the survivability status of supported units. It includes the number and type of positions dug (hull or turret defilade). Engineer platoons report the number and type of fighting positions to the engineer company that they have constructed. The engineer company calculates the percentage of survivability effort completed and maintains a count of the total number of fighting positions completed in the supported task force area. This report is forwarded to the higher engineer unit as required by the unit SOP.

Class IV and V special report (CLIV&VREP). This report tracks the status of critical engineer supply classes (IV and V) used by engineer units for M/CM/S missions. For example, a mine dump is established to support a specific obstacle group. The platoon controlling the mine dump reports the status of the type and quantity of mines available for use in obstacle emplacement. This report is used as a tool at the engineer company and battalion levels to track the availability of supplies, shift assets (when necessary), support current operations, and forecast supply requirements for future operations.

Flash SITREP. This report notifies the next higher unit when a subordinate unit becomes decisively engaged or has a critical shortage that will prevent mission accomplishment.

SPOTREP. This report is used by all units when observing any known or suspected enemy activity.

NBC report (1, 2, 3, 4, 5, 6, effective downwind message, nuclear warning (NUCWARN), and chemical warning (CHEMWARN)). These are the standard NBC reports.

Shelling report (SHELLREP). This report provides information on enemy indirect fire.

Enemy prisoner of war Report (EPWREP). This report is used when a prisoner or material of immediate tactical importance is captured.

Scatterable mine warning (SCATMINWARN) and scatterable mine report (SCATMINREP). These reports are used to notify affected units that scatterable mines will be or have been emplaced. (free text message)

Meaconing, intrusion, jamming, and interference report (MIJIREP). This report is used when the reception of radio signals is hindered, confused, or distorted by any external source or when instructions received from a station cannot be authenticated. The person experiencing the problem will immediately submit this report to the intelligence officer.

SPLASH report. This report informs higher headquarters of downed friendly aircraft.

Casualty report (CASREP). This report informs the parent unit of battle and nonbattle casualties and alerts medical treatment facilities of incoming casualties.

DA Forms 1155 and 1156. These forms provide detailed, eyewitness information of a soldier who has become a casualty.

Obstacle overlay. This report allows vertical and lateral information sharing on friendly and enemy obstacles (types and location) and may be merged (MCS) with operations graphics to determine impacts on friendly and enemy maneuver across the battle space.

APPENDIX E

WARFIGHTER INFORMATION NETWORK (WIN)

This appendix provides a general overview of the WIN. It specifically focuses on those FXXI systems that directly complement or support the corps and division engineer staff officers and their staffs for planning, tactical decision-making, information sharing, and C2 of engineer operations during execution.

Systems Concept Overview

The WIN is the integration of emerging and existing C4I technologies and concepts designed to increase the security, capacity, and velocity of information distribution throughout the battle space to gain information dominance. The WIN provides the deployed FXXI corps and division a communications framework that facilitates the electronic acquisition of information and vertical and horizontal exchange between digital systems. Information security is maximized through the use of these digital systems and provides the warfighter the necessary tools to conduct FXXI operations. For example, these tools allow the warfighter to project combat power, protect the force, gain information dominance, shape the battle space, conduct decisive operations, and sustain operations.

The WIN enhances maneuver-force mobility by interlinking the various BOSs to the ABCS. This concept of communication/information services provides a force multiplier to the warfighter, as current and future operations make greater demands on tactical voice, data, and multimedia signal-support systems.

To provide warfighters with key decision-making information, the various information systems are integrated into one homogeneous "system of systems" that encompasses the strategic, operational, and tactical levels and supports joint operations. Corps, division, and below systems are shown in Figure F-1, page F-2. They include componets of the Global Command and Control System (GCCS), Standard Army Management Information System (STAMIS), Defense Message System (DMS), and ABCS.

The GCCS supports joint and strategic planners of all the services with a common system to manage and execute crisis and contingency operations. It provides a means of interface to commanders-in-chiefs (CINCs), services/agencies C4I systems, for peacetime deliberate planning as well as crisis planning and execution. The GCCS is the realization of "C4I-for-the-warrior" concept. The concept builds upon lessons learned from previous conflicts, operational requirements, and the effects of rapidly changing technology.

The warfighter requires a seamless information system where boundaries between functions and sources are erased. The GCCS provides the seamless, integrated information to the warfighter when, where, and how it is needed. This enhances warfighter effectiveness by driving interoperability through the elimination of duplicated functionality and the convergence of joint warfighter doctrine via GCCS's integration of common command, control, and intelligence (C2I) methods. The GCCS uses the secret Internet protocol network (SIPRNET) as its communications backbone.

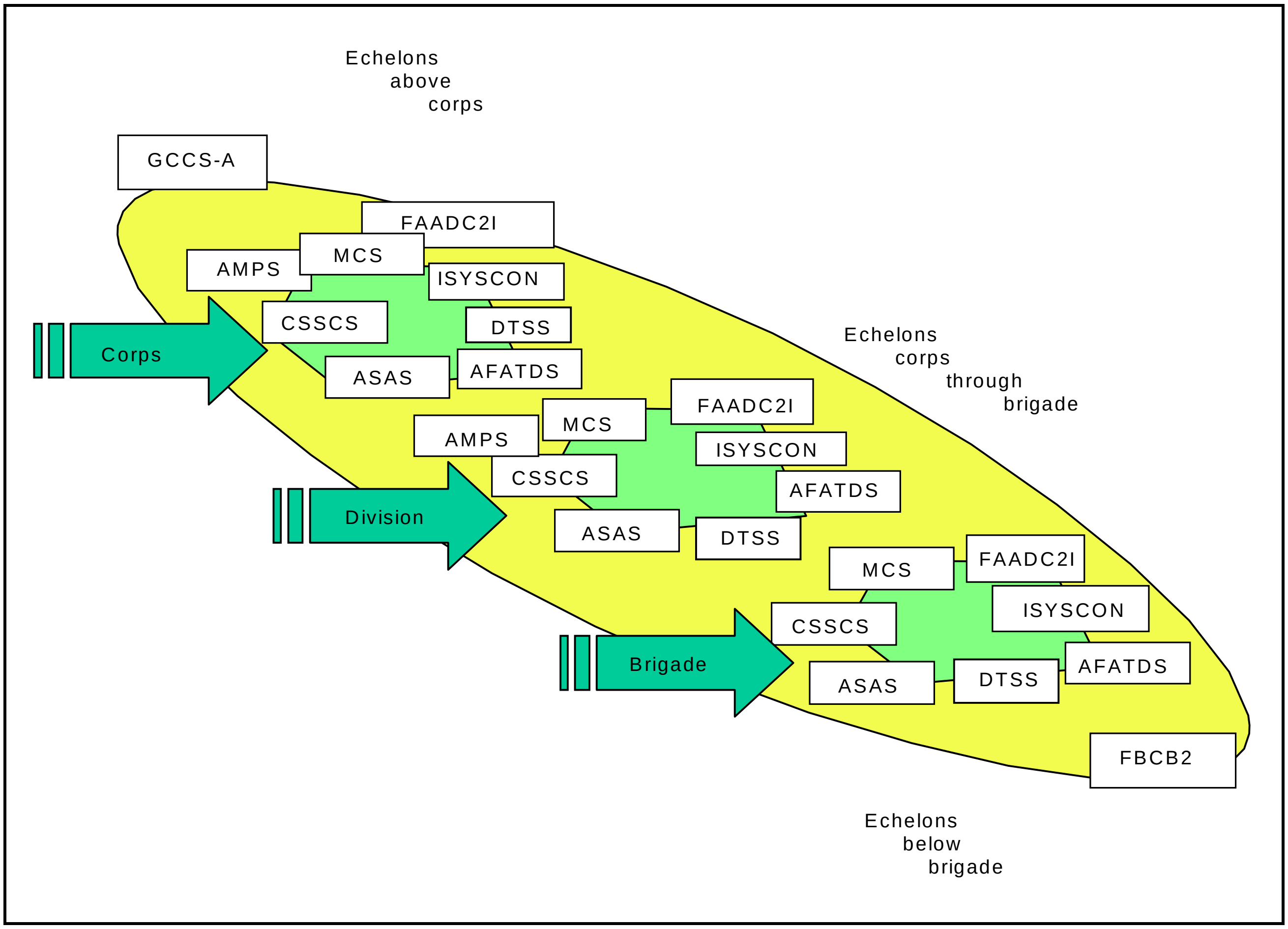


Figure E-1. WIN links in the corps's AO

The goals of the GCCS are—

- To provide, for all CINCCs, one affordable system that integrates across services and functions to provide the warfighter with a single picture of the battle space.
- To migrate legacy applications to modern computing principles and technologies through the use of a common operating environment (COE).

To support these goals, the GCCS includes applications that provide efficient monitoring, planning, deployment, employment, and sustainment of military operations from the NCA to the commander, JTF level.

The Global Command and Control System-Army (GCCS-A) supports Army strategic planners in the allocation, logistics support, and deployment of operational/tactical forces to the combatant commands. This in response to strategic planning and policy guidance provided by the NCA during crisis situations and operations from conventional conflict to stability and support operations. The Army Tactical Command and Control System (ATCCS) facilitates the integration of BOS operations. This speeds battle planning, COA development, and tactical decision-making; enables timely coordination to synchronize and integrate operations properly; and facilitates the control of operational tempos during execution.

Above corps, the STAMIS is accessed by the CSSCS to resource separate logistical, medical, and personnel information management systems and provide a continues flow of information from the sustaining base through the tactical level. These systems, continue to be upgraded. Currently they are not seamlessly integrated but are subsystems that reside on separate computer platforms. To bridge this gap, the GCSS-A initiative will fulfill the role of an integrated client/server system for all manning, arming, fixing, fueling, transporting, and sustaining support to the warfighter.

The DMS will be the single electronic-messaging system for all department of defense (DOD) fixed, mobile, strategic, and tactical environments. DMS will replace the automatic digital network (AUTODIN) and electronic mail (e-mail) messaging systems used today to provide greater services and eliminate current interpretability problems.

The ABCS will be the echelons corps and below (ECB) warfighter's primary information system to link strategic, operational, and tactical headquarters functionally. A more detailed discussion of its structure follows.

Army Battle Command Systems

The ABCS is the over all umbrella of systems that make up the FXXI C4I architecture. It supports leaders and planners, at the tactical to the strategical level through an integrated digital information network. This network is designed to provide automated C2 and SA information through a seamless data architecture of existing and planned C2 systems. The ABCS includes the GCCS-A, ATCCS, and FBCB2 (see Figure E-2).

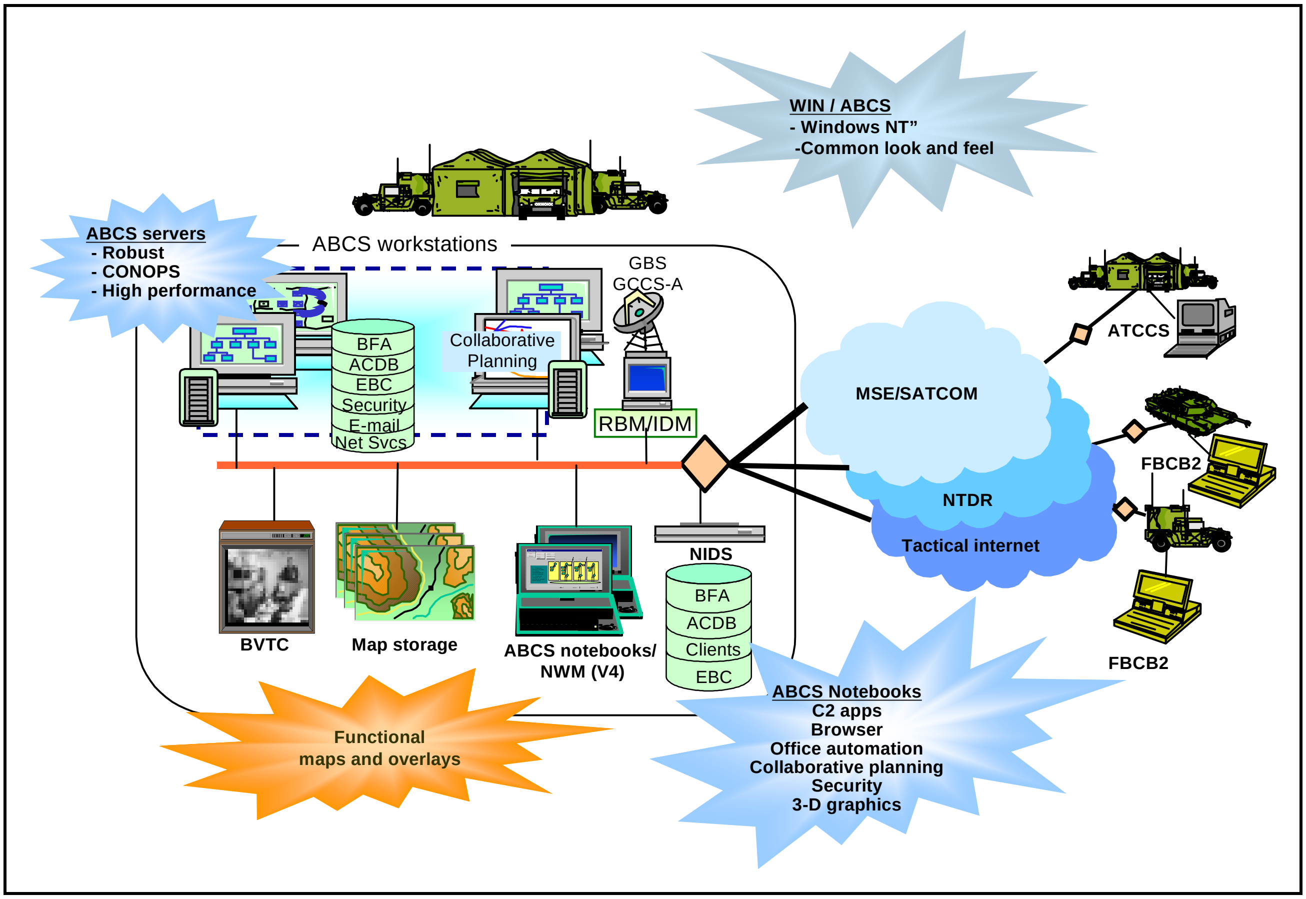


Figure E-2. ABCS

ATCCS

At echelons from corps to company level, the ATCCS provides C2 and SA information to commanders and staffs. The ATCCS allows for the seamless integration of information to the warfighter when, where, and how it is needed and provides the synchronization tools necessary to exchange information during operations. The ATCCS configuration utilized by the FXXI division is MCS, Advanced Field-Artillery Tactical-Data System (AFATDS), All-Source Analysis System-Remote Work Station ASAS-RWS, Forward Area Air Defense Command, Control, and Intelligence system (FAADC2I), CSSCS. These five ATCCS are compatible with many other ABCS systems that are utilized to obtain and pass information. Included in the ABCS configuration are the warfighter associate (WFA), IMETS, the DTSS, the Air Mission Planning System (AMPS), and the FBCB2. See, “Example of a FXXI division TOC LAN”, page E-10.

FBCB2

The FBCB2 system is a brigade and below battle-command-information support system. It is supported by existing and emerging communications, sensors, and electrical power sources. This system is designed to be used by combat, CS, and CSS units on every individual vehicle and Land Warrior platform, across all BOS disciplines during tactical operations. The FBCB2 includes both embedded battle-command software and appliqué tactical computer components.

BOSs

Combined-arms team commanders and staffs exercise force-level control (FLC) by integrating and synchronizing the efforts of each BOS to support the mission. This is accomplished by managing information from individual BOS interests and developing tactical plans and orders based on that information. ABCS configuration assists FLC component systems (also known as BAS) employed at ECB by providing the ability to share information instantaneously. Significant strides have been made in the resolution of interconnectivity and interoperability problems between the various ABCS. The interconnectivity and interoperability achieved now provides the commanders and staff at corps and below with the automated decision-support tools and information-gathering resources needed to develop SA and a RCP of the battle space.

NOTE: The FXXI division engineers primarily use the MCS-ENG function of the MCS to effect engineer planning and vertical coordination and to pass C2 instructions during mission execution. The MCS is located at each of the engineer cells in the corps’s, division’s, and brigade’s CPs. (See Appendix F).

MCS

The MCS is the primary information system supporting the maneuver commander and his staff. It provides the principal operational interface with software applications and automated tools that are needed to access and manipulate the force-level databases resident on other BOSs / ABCSs that make battle planning and C2 more efficient. For example, the MCS operators can update their MCS database by “pulling” information from other BOS / ABCSs. These systems are interconnected via LAN or can receive information via free text, FTP, or electronic messages through the tactical internet (TI). Based on an up-to-date database, the commander and his staff are better able to forecast readiness states, execute timely tactical decisions, quickly modify battle planning based on near-real-time information, and expedite orders dissemination. The MCS consists of window- and menu-based software allowing system operators to process, retrieve, store, and send information in text or graphic form. Reports, OPORDs, overlays, unit task orders (UTOs), and messages are available to the user.

AFATDS

The AFATDS is an integrated fire-support C2 system that is capable of processing fire missions and related information to coordinate and maximize all fire-support assets. These assets include FA, mortar, attack helicopter, air support, naval gunfire, and offensive electronic warfare.

Fire missions are processed through the fire-support chain to the weapon system at the lowest echelon that can bring the most effective fire on the target after the target-attack criteria are satisfied. This distributed processing capability allows the maneuver commander to influence the battle by placing the right mix of firing platform and munitions on enemy targets based on the commander's guidance and priorities.

The integration of all fire-support systems through the distributed processing capabilities of the AFATDS provides greater flexibility and mobility to fire-support units and allows greater management of critical resources. It provides current battle-space information, target analysis, and unit status; and it coordinates target damage-assessment coordination and sensor operations.

FAADC2I

The FAADC2I system is an integrated system of weapons, sensors, and C2. It protects maneuver forces, critical CPs, and CS and CSS elements from low-altitude air attack. It controls and integrates air-defence (AD) engagement operations and combined-arms force operations for AD elements. To support engagement operations, the FAADC2I system—

- Responds to air threats by integrating targeting functions, including sensor operations, and AD weapons C2 functions.
- Acquires and tracks incoming air threats.
- Identifies friendly and enemy aircraft.
- Automatically alerts forward AD weapons.
- Assists battle managers in planning, coordinating, synchronizing, directing, and controlling the counterair fight.
- Assists in developing and disseminating timely target data to all forward-area air-defense (FAAD) components.

To support force operations, the FAADC2I system provides force-level commanders with the information needed to integrate AD into the overall tactical plan.

ASAS-RWS

The ASAS-RWS is a functionally integrated intelligence support system. It manages sensors and other resources; collects, processes, and fuses intelligence data; stores, manipulates, and displays intelligence data; and quickly disseminates information to the commander by providing a RCP of enemy activity.

The ASAS-RWS supports the commander's decision-making process 24 hours a day, whether on the battle space or in rear support areas. It prioritizes and manages collection assets; and processes, receives, and correlates data from strategic and tactical sensors and other sources to produce ground-battle situation displays. The system then disseminates intelligence information to assist the commander in refining guidance, aids in target development, and provides recommendations.

CSSCS

The CSSCS is the logistics component of ATCCS; and it provides critical, timely, integrated, and accurate automated logistical information. This system provides information on all classes of supply, field services, maintenance, medical services, and movements to the commanders and staffs. The information is consolidated and collated into SITREPs and planning estimates for current and future operations.

The CSSCS provides a concise picture of a unit's requirements and support capabilities by collecting, processing, and displaying information on key items of supplies, services, and personnel that the commanders deem crucial to the success of an operation. Items tracked in the CSSCS represent a small portion of the items managed by STAMIS.

The CSSCS also supports the decision-making process with COA analysis. Staffs can analyze up to three COAs for a 4-day period. Variables include combat intensity, combat posture, unit task organization, miles traveled, and geographical region.

The CSSCS maintains a database of unit personnel and equipment authorizations by SRC, similar to table of organization and equipment (TOE) and unit/equipment planning factors. The CSSCS includes a database of equipment and personnel called a BRIL. The items that a commander identifies as critical to the operation can be selected from the BRIL to establish the CTIL.

This system currently provides situation awareness of critical elements within Class I, II, III, IV, V, VII, and VIII supplies, and within personnel-strength management. Maintenance, transportation, and medical functions are a few features that will be added as the system matures.

A2C2S

This is a UH-60 helicopter equipped with common networked computers, combat net radios (CNRs), Havequick ultra high frequency (UHF) radios, satellite communications (SATCOM), high frequency (HF) radios, and a digital map flat panel display to provide commanders from corps to maneuver level with a mobile C2 node for coordinating aviation support. The A2C2S has the capability to communicate and exchange information with aviation, maneuver, intelligence, fire support, close air support, and any other elements similarly equipped.

AMPS

The AMPS is an automated aviation mission planning/rehearsal/synchronization tool that is designed specifically for the aviation commander. There are two levels of AMPS— brigade/battalion and company. Each level provides the automated capability to conduct aviation missions. The brigade/battalion AMPS is hosted on the common hardware/software version 2 (CHSII) platform. This consists of a tactical computer unit (TCU) with 128-megabytes (MB) of random access memory (RAM), a 4.2-gigabyte (GB) removable hard disk drive, a compact disc-read only memory (CD-ROM) drive, a 1.3-GB magneto optical (MO) drive, a 19-inch color monitor, and a character graphics printer. All of these components can be used in the field. Additionally, the AMPS has an internal 9,600-baud modem. The AMPS software contains a modem applet allowing two AMPSs to transfer data files over telephone lines. Longbow Apache and OH-58D Kiowa Warrior AMPSs have a data transfer receptacle and data cartridge for loading/downloading mission data in the aircraft. The AMPS will be located in the maneuver brigade's aviation cell.

Improved Data Modem

The IDM passes targeting or SA information to and from airborne and ground platforms (digital and analog). The IDM replaces the Airborne Target Handover System (ATHS), but it retains backward compatibility with it. The IDM supports four links and one generic interface processor used for link/message processing (link formats include tactical fire [TACFIRE] and Air Force applications program development [AFAPD]). The IDM provides digital connectivity between the Army, Air Force, and Marines that provide C4I data exchange for attack and reconnaissance helicopters, TOCs, CAS aircraft, and near-real-time intelligence assets. It is designed to be hardware- and software-expandable and flexible. The IDM is used on the A2C2S, AH-64D, and OH-58D Kiowa Warrior and in the aviation tactical operations center (TOC) (AVTOC). The Longbow Apache uses version 2.62 and all others use version 3.0. Version 3.0 includes internet controller (INC) functions, allowing for data exchange with other INCs. VMF messages are not currently capable of being interchanged between the two versions. Limited radio assets on airborne platforms require operators to switch to a maneuver-support net when providing CAS.

Integrated Meteorological System (IMETS)

The IMETS provides a tactical, automated weather-data system for receiving, processing, and disseminating information to provide timely weather-environment effects, forecasts, and decision aids. The IMETS produces, displays, and disseminates weather forecasts and tactical decision aids that compare the impact of current, projected, or hypothesized weather conditions on friendly and enemy capabilities. The IMETS workstations are ATCCS-common hardware and are interoperable with ASAS-RWS, DTSS, and other ATCCS BOSs over tactical and area communications.

DTSS/Quick-Response Multicolor Printer (QRMP)

The DTSS/QRMP is a mobile automated terrain-analysis system supporting battle space operations at division to echelons above corps. This system is located at the supporting engineer battalion TOC to provide digitized and hard-copy maps, terrain studies, photographs, climatic summaries, weather forecasts and reports, and other data sources. It provides a geographic-information system to answer questions regarding terrain, bridges and other geographic features, and mobility considerations, using tables, maps, image files, and other products.

ATCCS Configuration

The physical configuration of an ATCCS's LANs varies with the information-flow requirements at each echelon. However, the LAN's logical architecture remains the same throughout the system. This overview is essential for the engineer's basic understanding of requirements that he needs to operate a digital CP.

An ATCCS's LAN consists of multiple BOS component systems sharing the same LAN at a CP. The tactical packet network (TPN) serves as the communication link for the Wide-Area Network (WAN) which connects the various ATCCS's LANs across the battle space. While the CSSCS, AFATDS, FAADC2I, and ASAS-RWS BOS's component systems may also operate their own internal LANs for stovepipe communications, the ATCCS's LAN is the primary communications path for passing information horizontally between BOSs. Each ATCCS's LAN is a high-speed, short-distance network for computer-to-computer communications. It has an effective transfer rate of about 3 MB per second and is implemented with the Institute of Electrical and Electronic Engineers' (IEEE) 802.3 "10-Base LAN standard and a bus topology". Channel access is through carrier sense, multiple access/collision detection (CSMA/CD). The packet protocol is transport control protocol/internet protocol (TCP/IP). The system is similar to the commercial Ethernet™ standard; and the terms Ethernet, ThinLAN™, and IEEE 802.3 10-Base2 are often used interchangeably. The TPN is also known as the mobile subscriber equipment MSE packet switch network (MPN). The primary assets used for TPN communications include the node center (NC), small extension node (SEN), large extension nodes (LEN), and system control center (SCC). These assets form the backbone of the tactical network linking the ATCCS's LANs (see Figure E-3, page E-8).

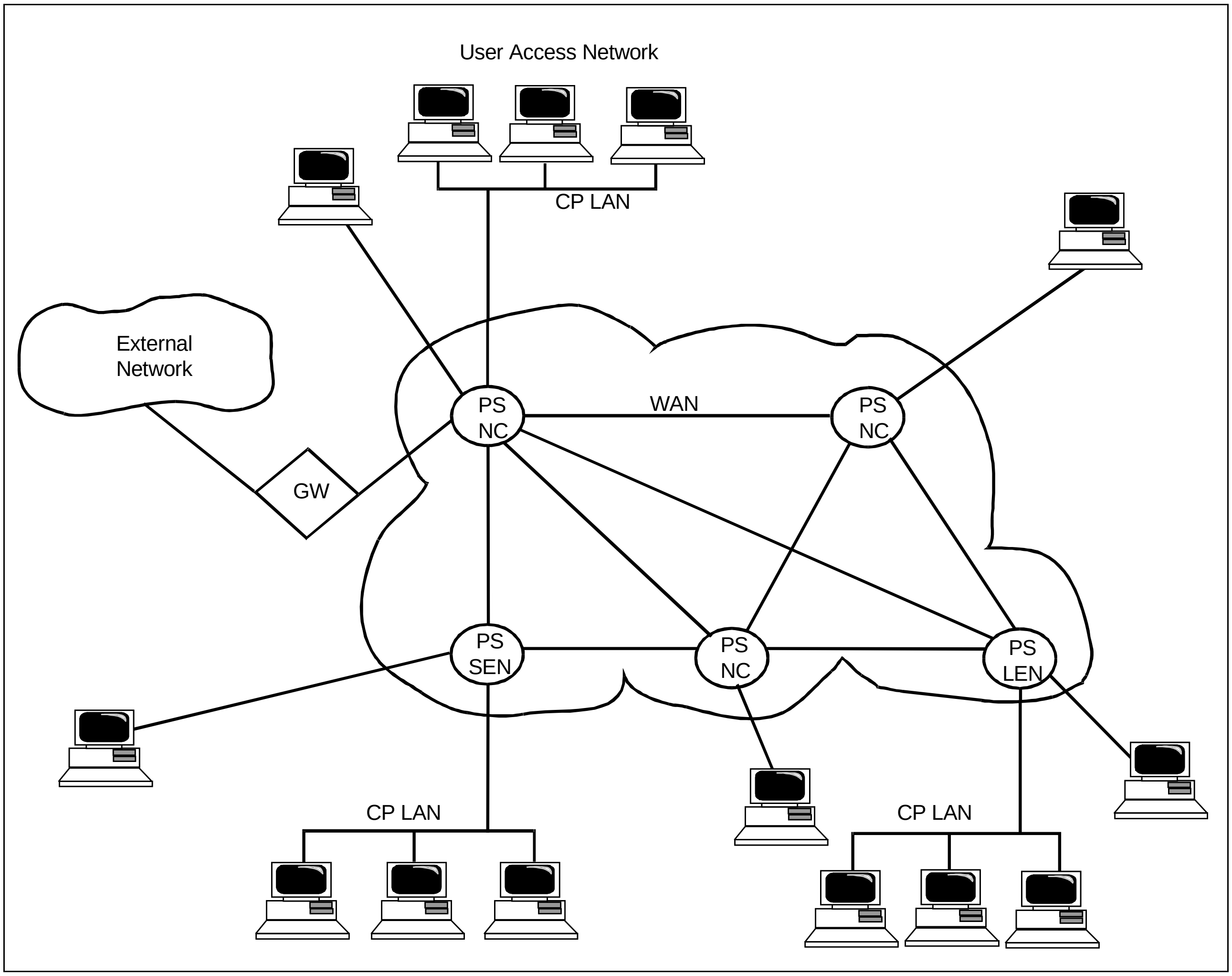


Figure E-3. Representative MSE architecture

CP ATCCS Terminal Organization

Terminal

A terminal is a single device— a high-capacity computer unit (HCU), for example— used by commanders, staff members, or other authorized personnel (See Figure E-3, page E-8).

Element

An element is either a single terminal or several terminals connected on a LAN. An element is commonly known as an operational facility (OPFAC). It is under the functional CP system as described in FM 100-5. An element normally has a specific function such as the S1/S4 section located in the brigade or battalion trains.

Node

A node is one or more elements that support a BOS. It could also be a CP such as the maneuver brigade.

Unit

A unit is a collection of nodes that supports a military organization at a particular location (CP).

COMPUTATIONAL ENVIRONMENT

The ATCCS is arranged to maximize the capabilities of each component. The systems used to do this are listed below:

- Distributed computing environment (DCE).
- Data distribution system (DDS).
- X-term.
- LAN.
- WAN.

DCE

The basis of the DCE is the client-server relationship. A server is a HCU that is running server software; a client is a HCU that is running client software. Therefore a machine may act as a client in accomplishing one function but as a server in accomplishing another. The server database is automatically updated from its clients. The server then updates other servers throughout the chain of command. This ensures that all unit databases remain current. In an ATCCS client-server configuration, each server can have multiple clients connected to it in a LAN. When a user on a client machine executes a specific application, the client requests the data from its connecting server. The software operates exactly the same on either machine, and the user cannot tell where the software resides.

Due to the high workload in an ATCCS cell, no one HCU could handle the volume with all the applicable software provided by a client-server configuration and effectively run all required operations at a speed usable by operator. A client-server configuration provides this usable speed, however the disadvantage in this configuration is that if a server fails or if the LAN is broken, each client will only be able to perform the functions on its HCU until the LAN is reconfigured or repaired.

Through a process known as *beaconing*, the DCE, network, and system-administration workloads can be minimized, allowing greater automation of the DCE and network configurations. This process also allows for unique cell setup and identification of the DCE and network problems. beaconing provides reconnection of client BOS component systems that are temporarily disconnected from the cell LAN without having them to reboot.

DDS

The DSS is the means by which database updates are replicated through the LAN or WAN. Data generated in one cell can be passed to all the other cells in the system, thereby providing all CPs with the same information, which includes tables, maps, reports and course of action white board conferences. The data is shared using MSE, tactical fiber-optic cable assemblies (TFOCA), coaxial cable, or CNR. The type of network used, limits the number of cells that can be connected together and the distance between cells. A coaxial LAN of the type used in the ATCCS is limited to 600 feet in overall length, unless special hardware is used to extend the LAN. Each Standard Integrated Command Post System (SICPS) contains 50 feet of coaxial cable. A TFOCA network can extend to 1,600 feet. There is 10 feet of fiber-optic cable used in each SICPS. Weather and LOS conditions limit the radio network range. Data is sent between the cells by the DDS as a series of transactions. Each transaction is a single data record that is transmitted over the selected media. As the data-update traffic increases and the number of users on the network increases, the network load will increase.

X-Term

The X-Term is the means of access, through the X-Windows system, that other BOSs have into the MCS. The MCS user is affected by this action only by the time the HCU takes to complete a given task when the other BOSs update the database. An MCS user can work in one part of the MCS while another BOS accesses another part. Each user can complete his task without affecting the others. The system user/administrator controls which BOS hosts have X-Term access.

LAN

A LAN is a group of computers and related equipment connected together using data cables. In the ATCCS system, the type of data cable used is a 50-ohm coaxial cable or TFOCA. The TFOCA is used to connect a LAN when distances between the LAN vehicles require a greater, total LAN cable, length than 600 feet, or when greater durability and data capacity are required. Any combination of an HCU, a lightweight computer unit (LCU), or a fiber-optic medium attachment unit (FOMAU), up to 30, can be connected on a LAN. Up to 100 FOMAUs can be connected in a fiber-optic ring. The fiber-optic cable will be connected in linear fashion from the first vehicle in the LAN to the last. The connection will effectively form a ring, since there are two paths within the cable. Optic signals will traverse each of the connections to the cable and then return to the source, (see Figure E-4).

WAN

A WAN is similar to a LAN but covers a larger distance. It is a network of networks that is constructed from a number of LANs connected to each other and to radio networks such as a CNR or a MSE. Because of the limitations of a network constructed with coaxial cable, a WAN uses a combination of the MPN and radio networks to distribute the a data where necessary, through the system.

The ATCCS staff users' guide, and the ABCS systems management techniques manual, contain additional information on the ATCCS's and ABCSs functionality, management, and employment.

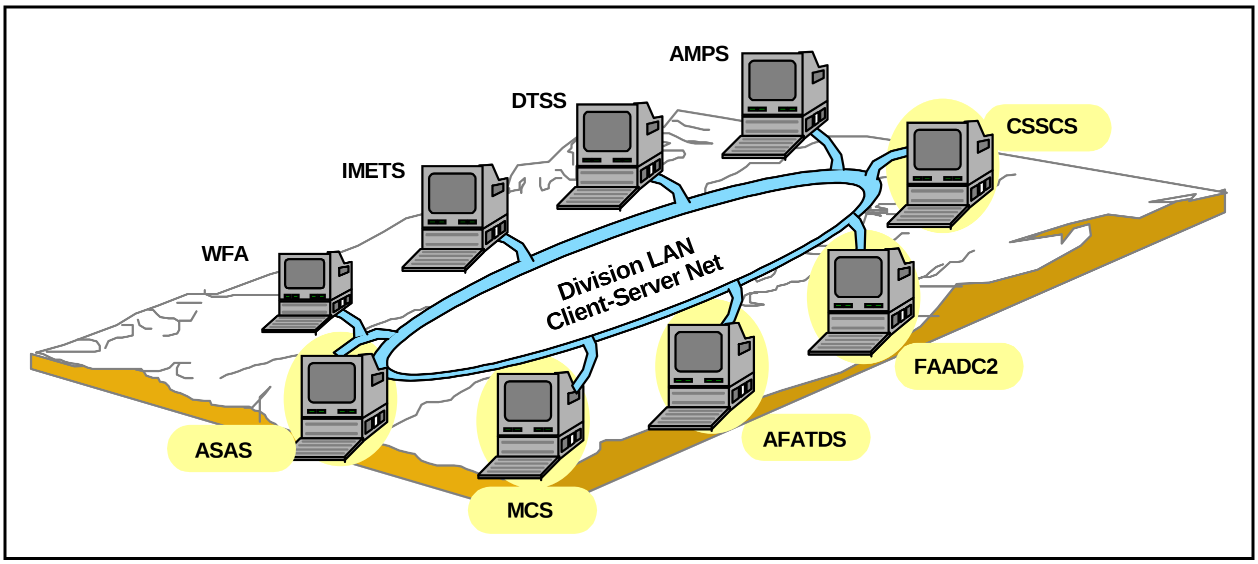


Figure E-4. Example of a FXXI division TOC LAN

APPENDIX F

ENGINEER DIGITAL SYSTEMS

The engineer systems discussed in this appendix and shown in Table F-1 are those that directly impact FXXI division engineer planning and operations. Some of these systems, such as the Grizzly, Wolverine, Land Warrior with a DRS function, and ASTAMIDS, are in various stages of development and are not yet fielded. They are included in the discussion of engineer digital systems since they provide a baseline understanding of systems' capabilities, and they may be played in future simulation exercises, AWEs, and demonstrations.

Table F-1. Engineer systems and references

Force XXI Systems	References
Land Warrior/DRS	FM 5-170, Appendix H
Grizzly	FM 20-32, Chapter 10; FM 90-31-1, Appendix B
UAV/ASTAMIDS	FM 20-32, Chapter 10
Wolverine	FM 90-13-1, Appendix B
DTSS	FM 5-105, Chapter 4
Hornet	FM 5-10, Chapter 3

MCS–ENG

The MCS-ENG is an engineer-specific software system that is subordinate to the MCS. It is software that will reside on the MCS version 12.0+. The system provides automated C2 capability to engineer staffs and commanders. MCS-ENG operates on the Army Tactical Command and Control System (ATCCS) common hardware. It provides engineer information to MCS, provides specific engineer planning and operations tools, allows engineers access to interface with terrain DTSS products, and links with intelligence and maneuver data. The MCS is a C2 system which provides the maneuver commander and his staff (corps down to separate maneuver brigades) with automated assistance to execute precise, near-real-time C2 of combat forces. Data transferred electronically over LAN/wide-area network (WAN) through available communications media using MCS protocols feeds information down to the FBCB2 systems. Basic missions of the system are inputting, processing, and outputting data to support the MCS-ENG information requirements. The MCS-ENG automation system contains an automated interface to the MCS.

Employment Concept

FXXI engineer elements supporting the FXXI division and its maneuver brigades will receive the first MCS-ENG software. A downsized version of the MCS-ENG software will also be initially distributed to engineer companies supporting the maneuver brigade's battalions to enable digital engineer reporting and C2. This downsized version of the MCS-ENG software distributed to engineer companies will be a part of the FBCB2 system.

Planning Considerations

The MCS-ENG functionality allows the engineers to develop detailed engineer plans and support the maneuver commander with the following capabilities:

- Operations.

—Client-server relationship with a terrain evaluation model (TEM).

—Engineer task organization.

—Mobility-corridor evaluation.

—Resource allocation and scheduling.

—Bill of materials.

- Mobility.
- Ground-distance overlay.
- Potential LOCs.
- Corridors.
- Countermobility.

—Obstacle planner (analyzer).

—Obstacle effects (ditches/berms, craters, Raptor ICO, and minefields).

- Survivability.

—Planner (position excavation and weapons-effects calculations).

—Construction (crew-served weapons and vehicle positions and TOCs).

- Digital terrain data.

—Digital terrain elevation data (DTED) I and II.

—Interim terrain data (soil, slope, vegetation, transportation, drainage, and obstacles).

- Tactical decision aids.

—Terrain data query (LOCs and data extraction).

—Intervisibility (optical LOS, communications sitings, and weapons fans).

Raptor-ICO

The Raptor-ICO (Figure F-1) detects, classifies, and engages heavy and light tracked and wheeled vehicles. It is a hand-emplaced reinforcing tactical obstacle, which consists of Hornet-PIP munitions, Gateways, and Advanced Acoustic Sensors (AASs).

The Raptor introduces an entirely new concept to the combined-arms team. Whether the Raptor uses the hand-emplaced, wide-area munitions product improvement plan (HE-WAM PIP,) also known as “Hornet PIP,” or another system, it type-categorizes enemy vehicles, reports, and then engages on those vehicles.

It can be ordered or programmed to develop coordinated attacks with other minefields and/or direct- and indirect-fire weapons. The Raptor can be inactivated, allowing freedom of maneuver through (lane) the obstacle while still providing near-real-time intelligence and situational awareness. The Raptor has standoff detection and engagement capabilities. It attacks from the side or the top at ranges up to 100 meters.

The Raptor-ICO is a reinforcing, tactical obstacle that, when properly integrated, attacks enemy maneuver and multiplies the effects and capabilities of firepower. It—

- Can be used as a stand-alone tactical obstacle or synchronized with other conventional obstacles.
- Will disrupt and delay the enemy, allowing long-range, precision weapons to engage more effectively. This feature is particularly effective in non-LOS engagements.
- Will be able to communicate with its employing unit for remote on/off/on or program, reporting battle-space intelligence. The battle-space intelligence data may include target descriptions, numbers, and the direction and rate of movement. It could also provide an early warning of the enemy’s activity.
- Can communicate with other munitions for conducting coordinated attacks.

The Hornet PIP is a subset of the Raptor and is the first of several systems fielded to Force XXI. The Raptor will be integrated into the

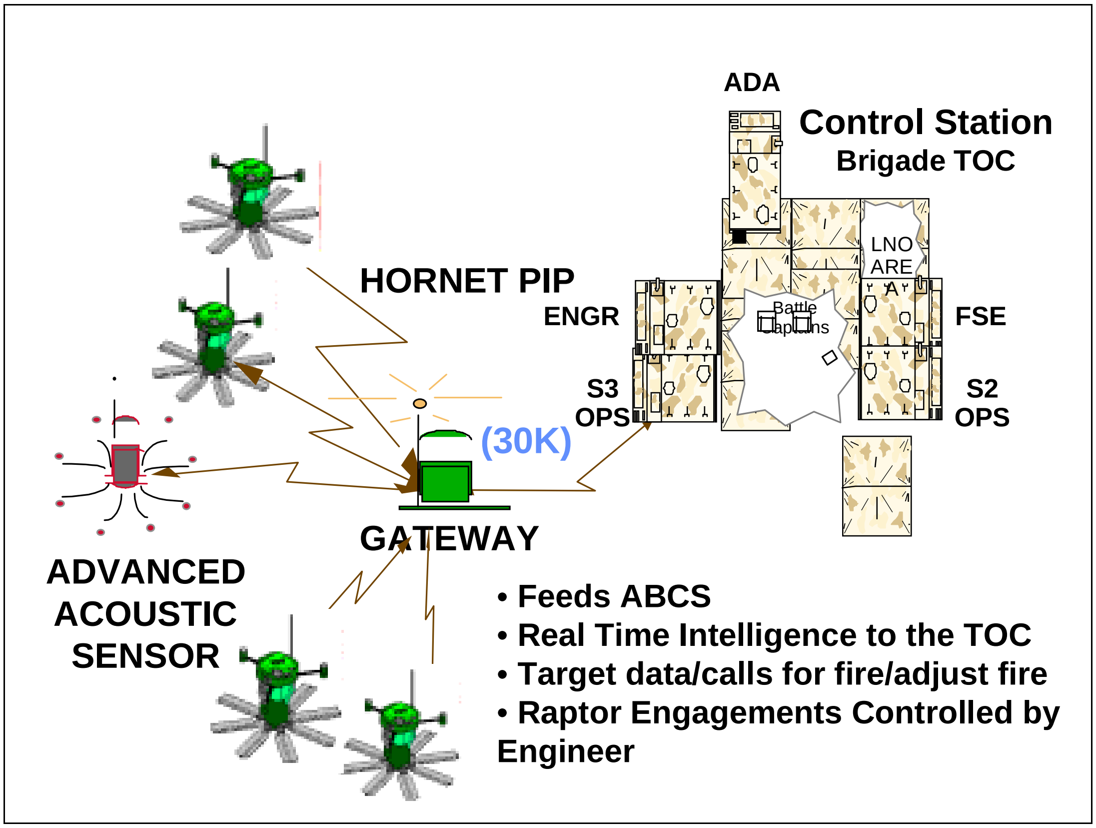


Figure F-1. RAPTOR intelligent combat

Army Battle-Command System (ABCS) and Army common hardware (ACH).

When properly integrated, the Raptor has the capability of being employed as either a directed or situational tactical obstacle. Some examples of situational employment include early disruption of moving enemy forces, covering CATK routes, and providing flank security. When employed in these capacities, the on/off/on or preprogrammed capability maintains the obstacle effect but does not hamper the maneuver commander's flexibility.

EMPLOYMENT CONCEPT

Combat engineers, maneuver forces, and/or remote vehicles under engineer supervision and at extended ranges by special operations forces and rangers, will emplace the Hornet PIP, "Gateway" (local Hornet PIP attack coordinator) and the AASs in the battle space. They will be employed throughout the entire depth of the battle space to support Army operations. In the MBA, they can be used to fix the enemy and weaken him along his avenues of approach. The Hornet PIP, with the AAS and Gateway, can be emplaced as an offensive-support weapon system because of its quick emplacement time and area denial capability. They can be employed rapidly along exposed flanks during a maneuver as a situational obstacle to disrupt the enemy's CATKs.

In the deep fight, the Raptor can provide real-time intelligence in support of the R&S effort. The Hornet PIP, with the AAS and Gateway, can be used at the enemy's decision points to provide an early warning of enemy intentions or to influence the enemy to a particular COA through coordinated Hornet PIP and precision-munitions attack to disrupt his movement. Figure F-2 page F-4, depicts Raptor-ICO's versatility and capability.

Employment Considerations

The division commander will have numerous systems under his control and must rely on

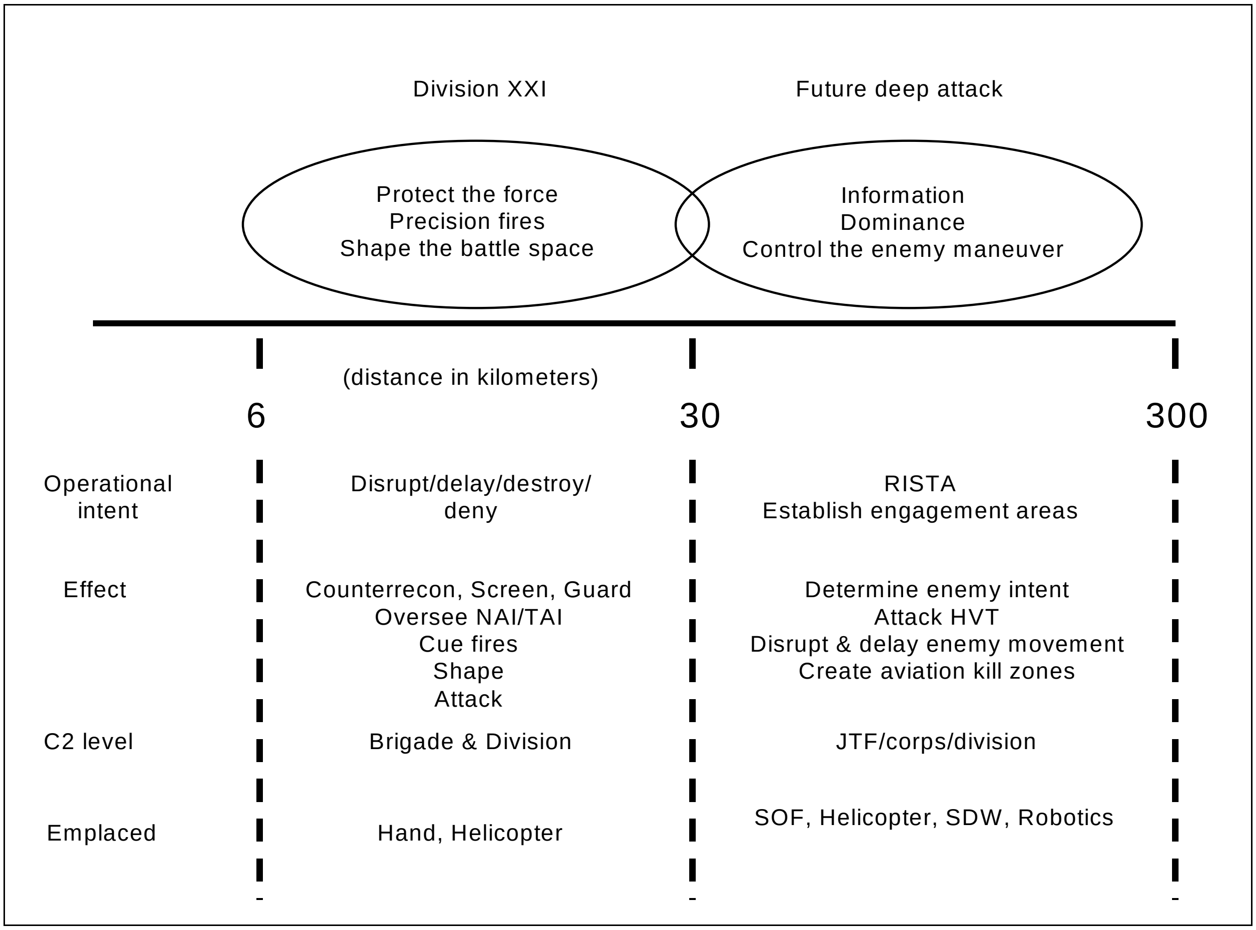


Figure F-2. Raptor ICO's versatility and capability

his staff to properly plan, integrate, and control each system into all plans and operations. The division commander, through the division engineer or SES, will exercise C2 over Raptor ICO through planning, preparing, and executing all phases of operations. Raptor-ICO planning and integration by the division engineer will follow doctrinal C2 processes. The division engineer will control Raptor-ICO employment, monitoring, handoff, and/or system recovery in the division's battle space. Because of its prospective intelligence-gathering capability, the employment of the Raptor ICO is closely coordinated with the G2. Used as a mine, its use will be coordinated with the G3 to facilitate shaping of the battlefield and coordinated with the FSCOORD for the synchronization of direct and indirect fires (see Figure F-3).

Engagement Procedures and Tactics

As stated earlier in this appendix, Raptor ICO can be employed to control and dominate the battlefield. The Raptor can be emplaced and armed by engineer personnel or SOF. The following series of figures illustrates how Raptor ICO can be used to support tactical operations.

Figure F-4 demonstrates how Raptor ICO can be used in an economy-of-force role. In the scenario shown, Raptor ICO could be emplaced along likely avenues of approach by aerial insertion of an engineer squad, delivery of the sensors, or by air or artillery means. The Raptor ICO, in this case, is remotely monitored and used to identify the friendly axis of advance, protect the flanks of the main attack, and trigger other tactical actions to disrupt the enemy's movement.

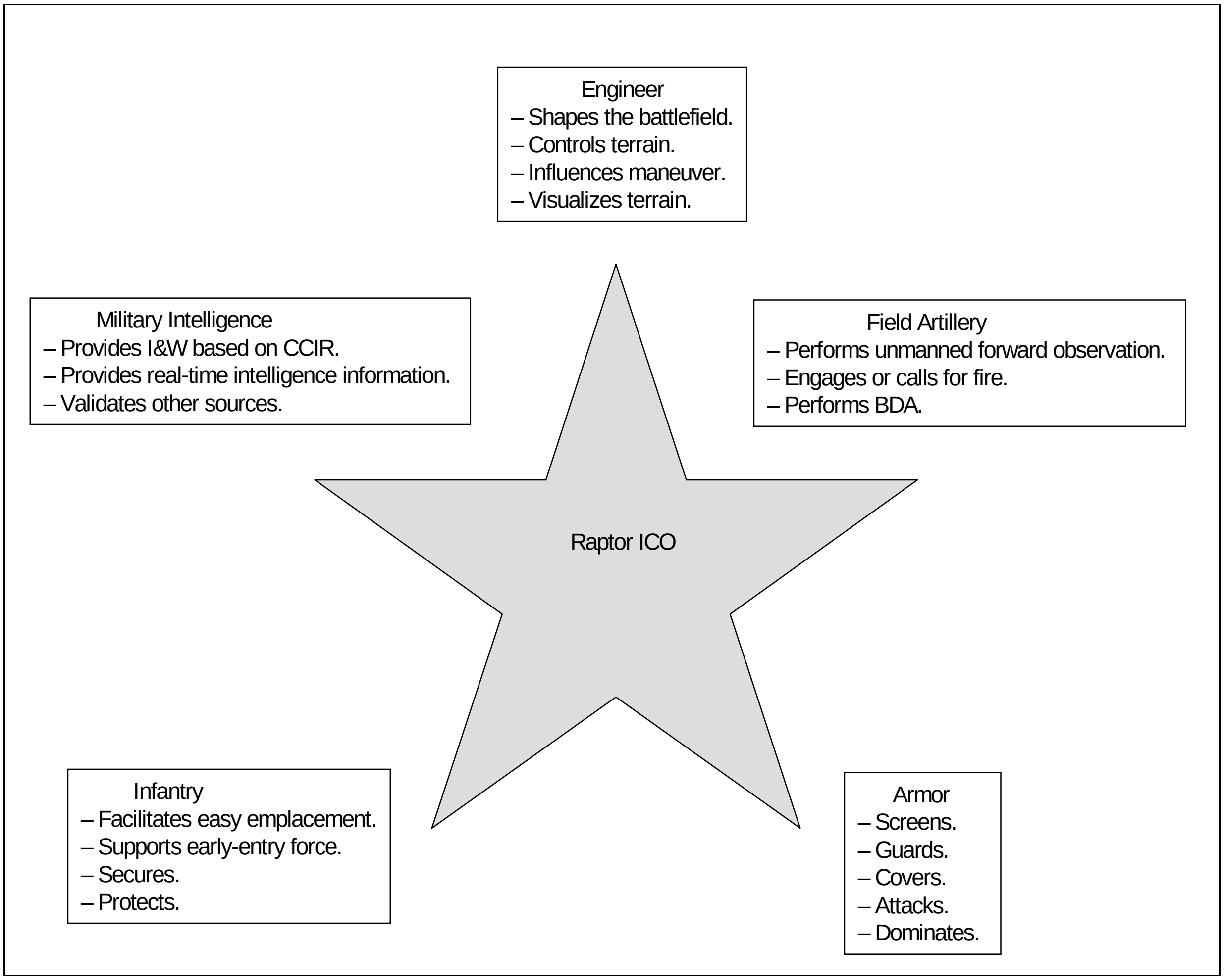


Figure F-3. Raptor-ICO employment considerations

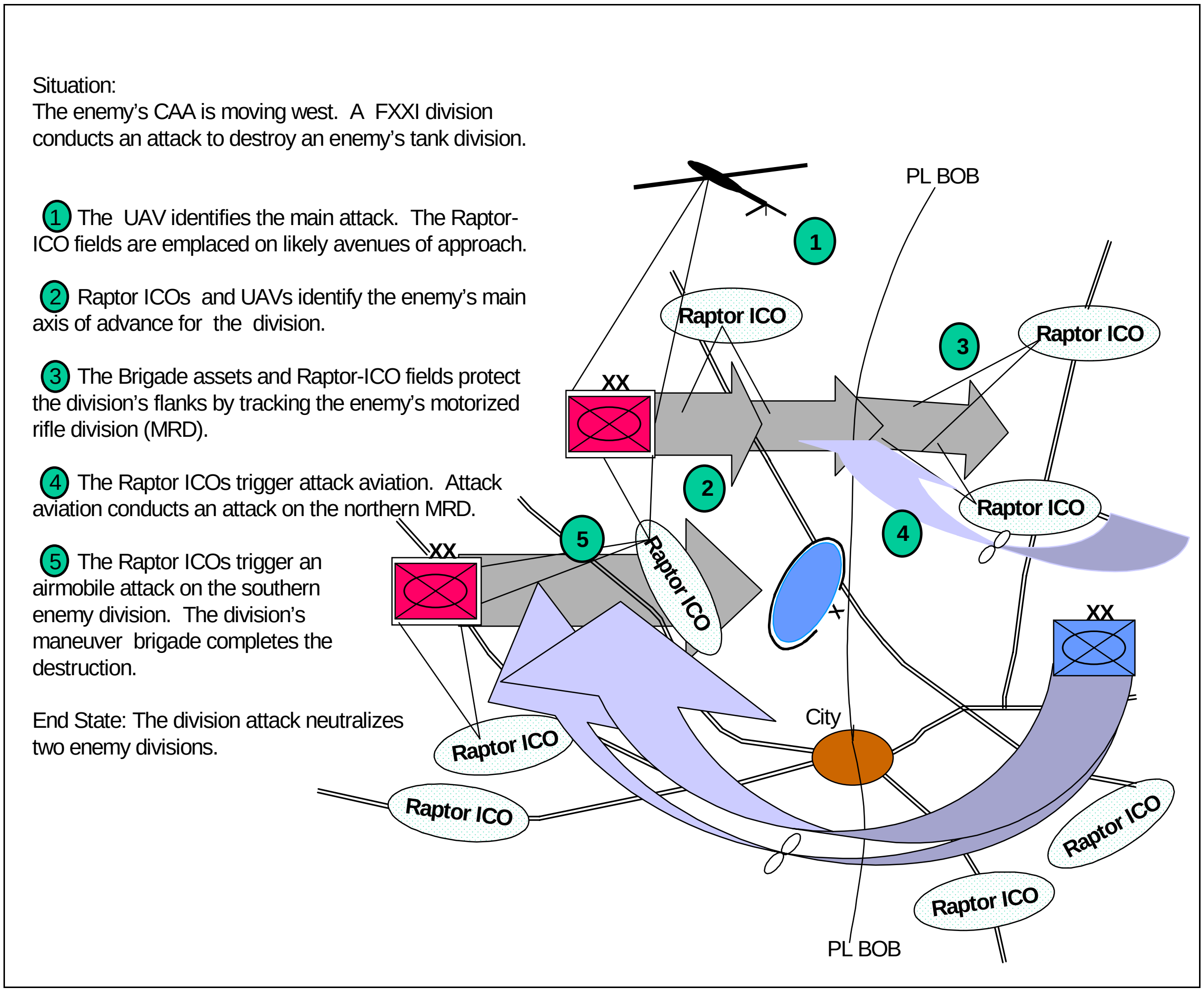


Figure F-4. Raptor ICO in an economy-of-force role

Figure F-5 demonstrates how the engineer might employ Raptor ICO in support of the deep fight. Raptor ICO is placed well forward to gather intelligence related to the enemy's movement; provide early warning; and trigger deep attacks by either the CAS, long-range artillery or aviation systems, maneuver, or airmobile operations.

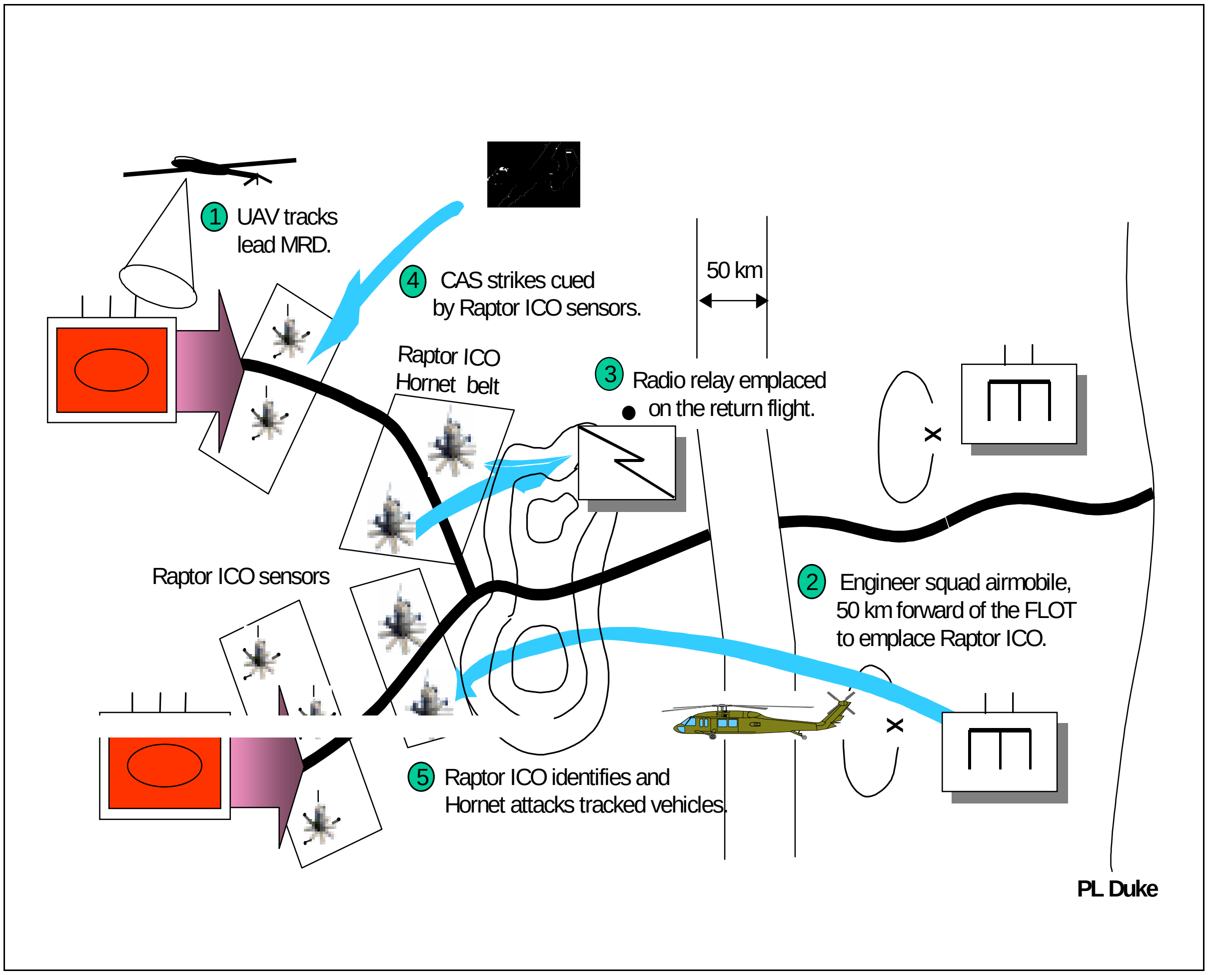


Figure F-5. Engineers conduct "raptor raids" in support of deep operations

Figure F-6 illustrates how the Raptor ICO may be used during cross-FLOT operations in support of a combined-arms attack. In this case, the engineer would employ Raptor ICO as part of a combined arms trap.

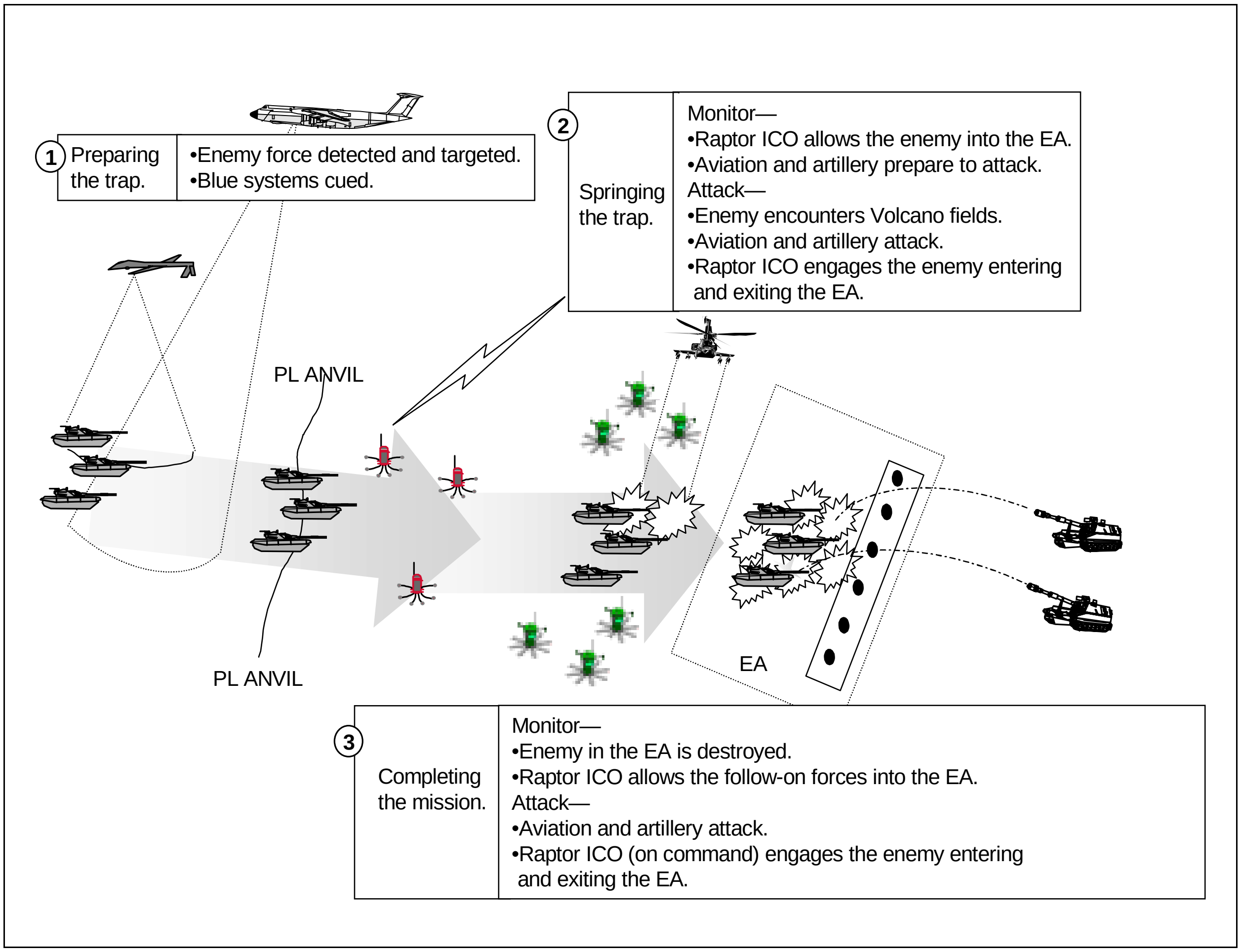


Figure F-6. Raptor ICO used in a combined-arms trap

Figure F-7 illustrates those actions/activities that would be performed following a maneuver commander's establishment of targeting priorities and attack strategies. In this case, the target-identification and targeting process begins with the alert provided by Hornet-PIP acoustical sensors. Attention should be paid to the connectivity of the ABCS, information flow between systems, information outputs, and actions/activities performed by each activity to obtain maximum effectiveness of both digital systems and weapons platforms.

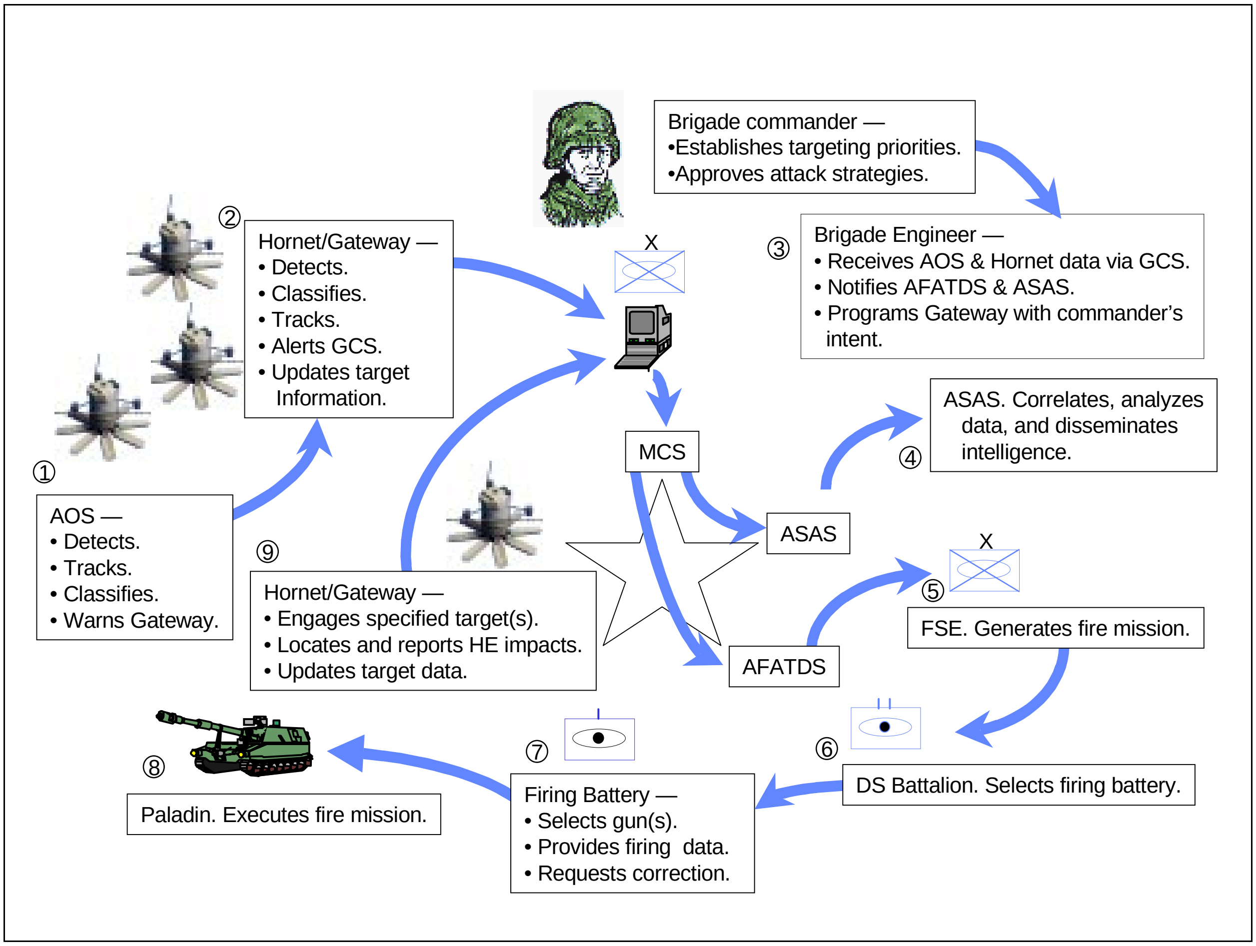


Figure F-7. Connectivity and synchronization

Figure F-8 illustrates the use of Hornets and acoustical sensors employed as a disrupt obstacle in an X pattern. While the X pattern is highly effective, other types of obstacles, such as Volcano, should be integrated with Hornet and Raptor ICO (when available) to achieve turning, blocking, or fixing effects.

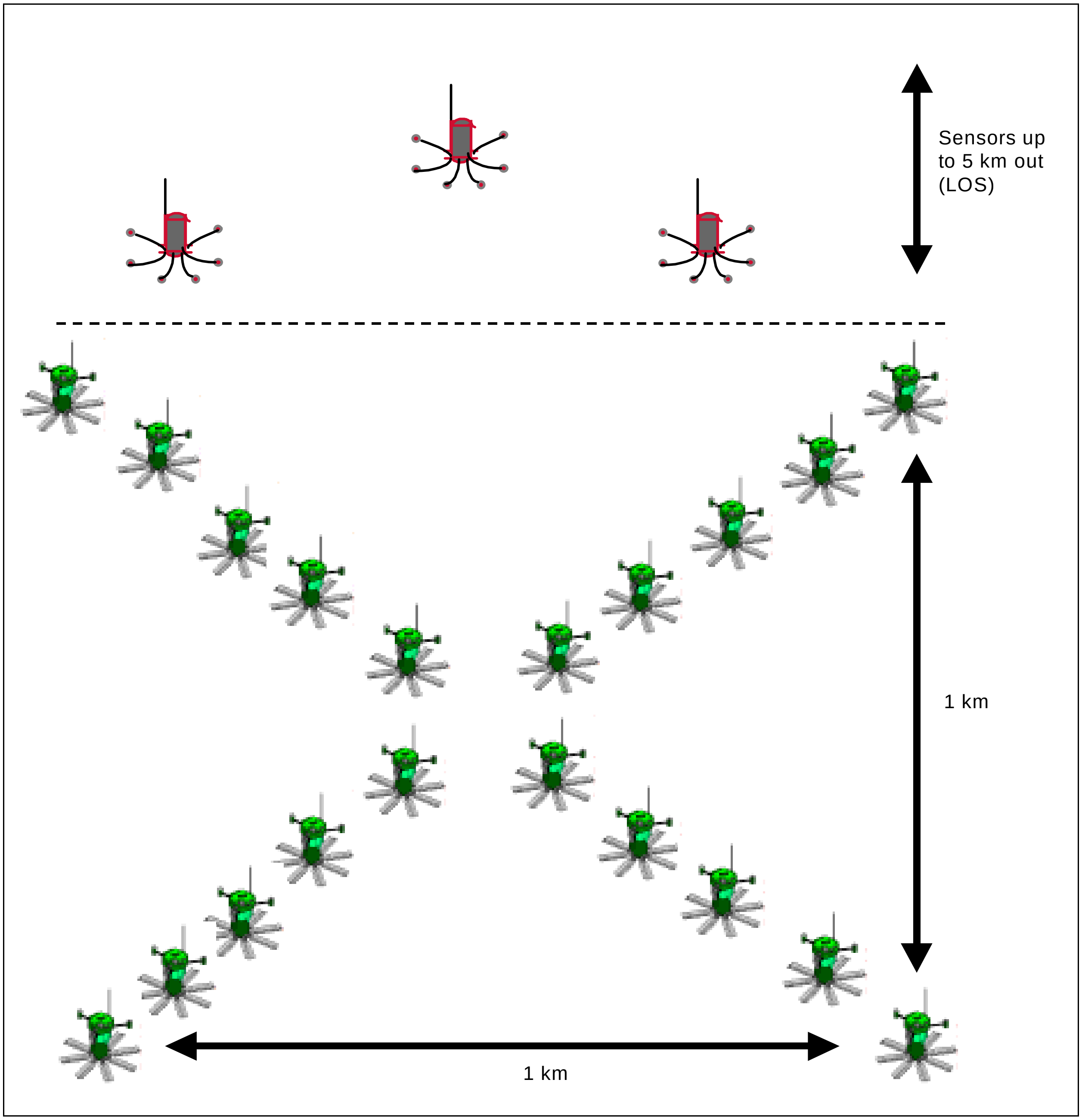


Figure F-8. X pattern, disrupt obstacle

Figure F-9 shows Hornets and acoustical sensors when employed in a gauntlet pattern. This pattern is very effective in constrictive terrain along the enemy's avenue of approach.

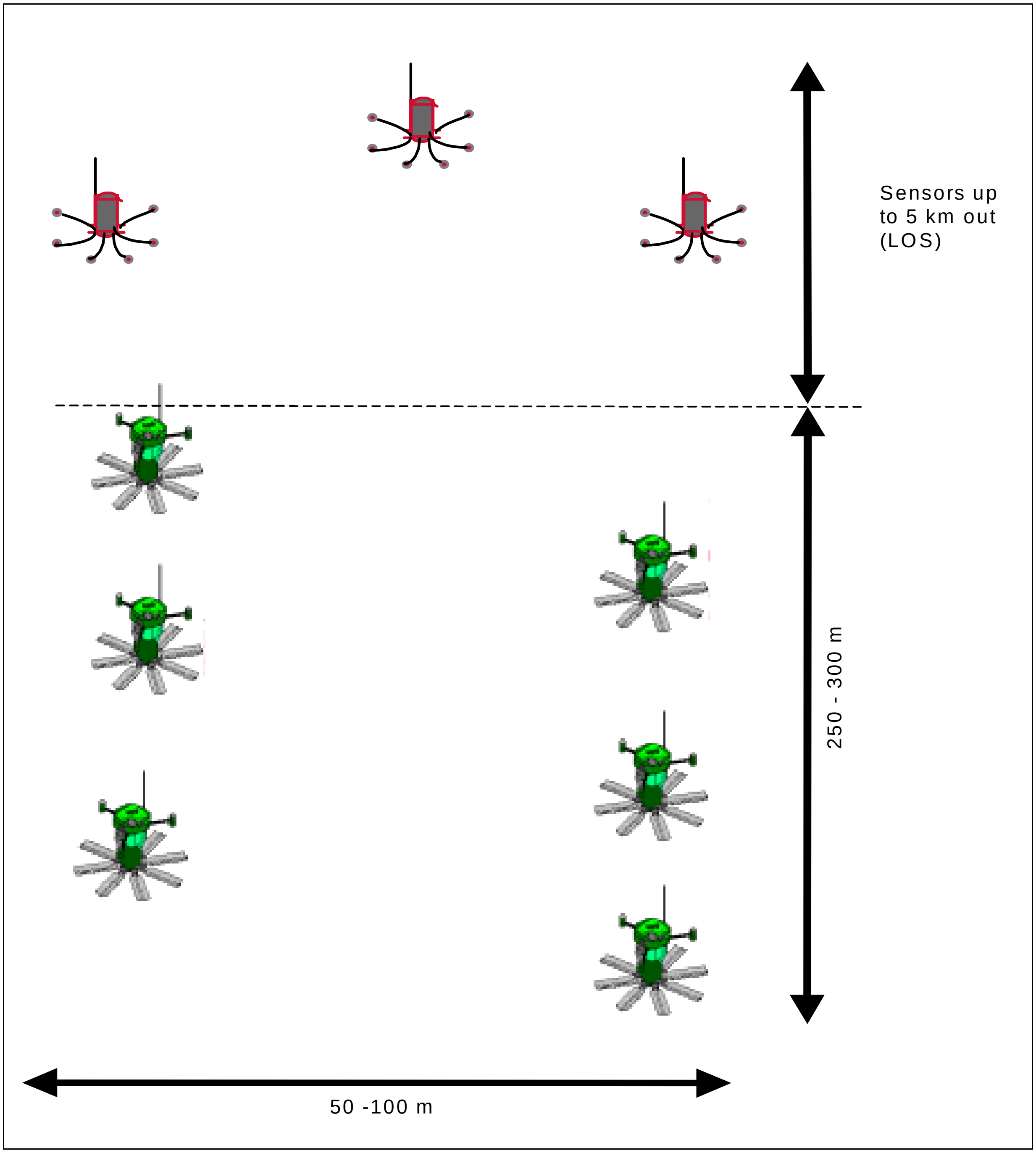


Figure F-9. Gauntlet pattern

Figure F-10 illustrates how Hornets, WAM clusters, and Volcanos may be employed with existing terrain features to provide early warning and facilitate shaping of the division's' battlefield.

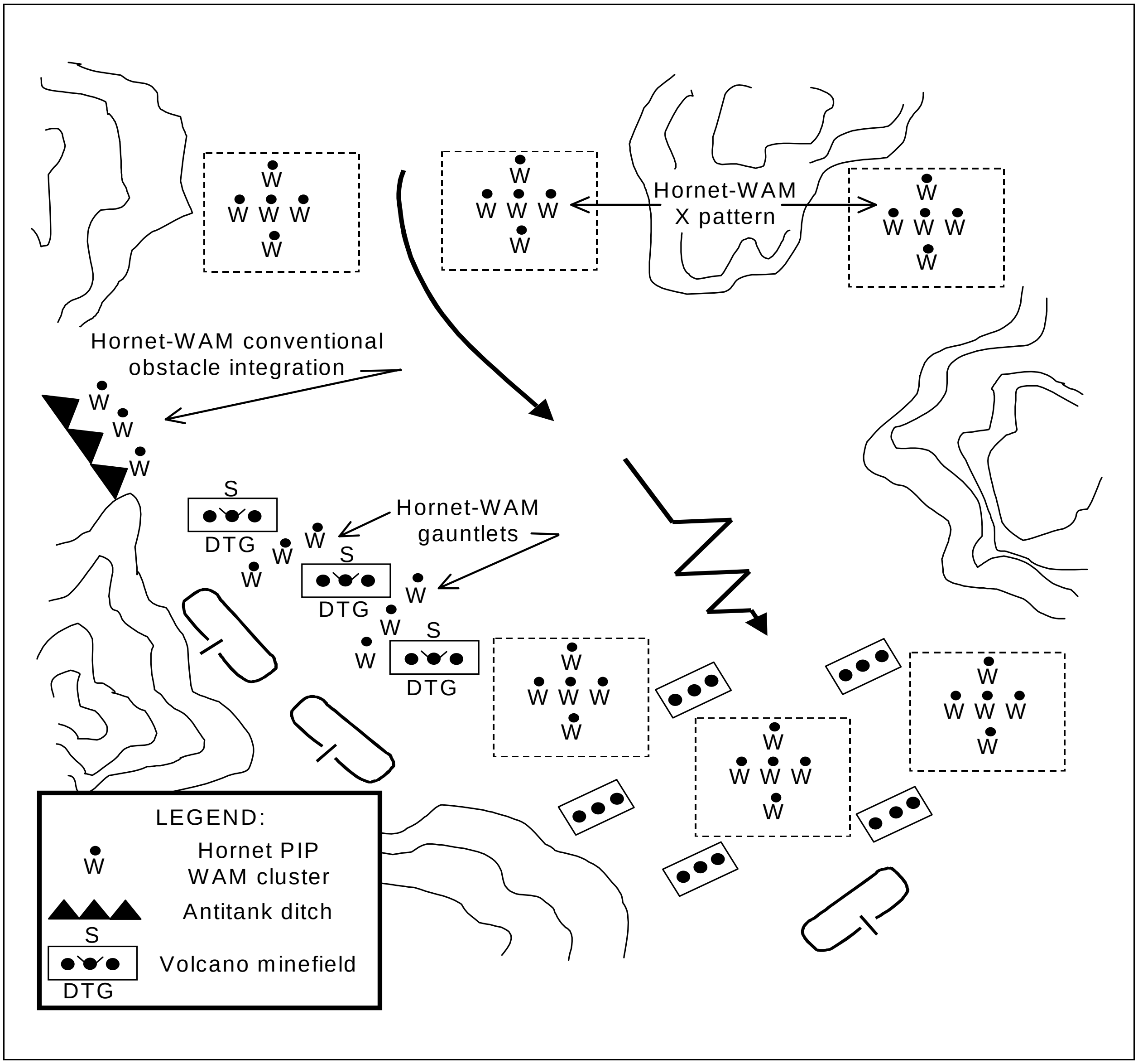


Figure F-10. Raptor ICO integrated with other types of obstacles

GLOSSARY

O6	colonel
1SG	first sergeant
2IC	second in command
A2C2	airspace command and control
A2C2S	Army Airborne Command and Control System
A&O	assault and obstacle
A/L	administration/logistics
AATF	air assault task force
ABCS	Army Battle Command System
ABE	assistant brigade engineer
ABMOC	air-battle management operations center
ACDB	ABCS common data base
ACE	armored combat earthmover
ACE	analysis and control element
ACT	analysis and control team
ACUS	Area Common-User System
AD	air defense
ADA	air defense artillery
ADAM	area denial artillery munition
ADAS	air-delivered acoustical sensor
ADC	assistant division commander
ADC-M	assistant division commander for maneuver
ADC-O	assistant division commander for operations
ADC-S	assistant division commander for support
ADDS	Army data-distribution system
ADE	Assistant Division Engineer
admin	administrative
ADO	air defense officer

ADO	Army Digitization Office
ADP	automated data processing
ADSO	assistant division signal officer
AFAPD	Air Force applications program development
AFATDS	Advanced Field Artillery Tactical Data System
AFB	assault float bridge
AG	Adjutant General
AGM	attack guidance matrix
ALO	air liaison officer
ALOC	administrative logistics operations center
AMB	ambulance
AMDWS	air-missile defense Workstation
AMPS	Aviation Mission Planning System
ANBACIS	Automated Nuclear, Biological, and Chemical Information System
AO	area of operations
AOS	acoustical overwatch sensor
AP	antipersonnel
AQF	Advanced Quickfix
ARNG	Army National Guard
ARO	auxiliary readout
arty	artillery
ASAP	as soon as possible
ASAS	All-Source Analysis System
ASAS-RWS	All-Source Analysis System-Remote Workstation
ASP	ammunition supply point
ASPS	all-source production section
assault	The culmination of an attack which closes with the enemy. A phase of an airborne or air assault operation beginning with delivery of the assault force into the objective area and extending through the attack of objectives and consolidation of the initial airhead. To make a short, violent attack against a local objective, such as a gun emplacement or fortified area.
assault breach	A breach tactic used by small units (company teams and platoons) to penetrate an enemy's protective obstacles and seize a foothold within his defense.

	Normally a very decentralized operation with SOSR synchronized at the platoon and squad level.
assault force	In a breach operation, those forces charged with passing through a breach- and enemy-fortified position or strongpoint and seizing the objective or completing destruction of the enemy. One of the three breach organizations.
asst	assistant
ASTAMIDS	Airborne Standoff Minefield Detection System
AT	antitank
ATCCS	Army Tactical Command and Control System
ATCMS	Army Tactical Missile System
ATGM	antitank guided missile
ATHS	Airborne Target Handover System
atk	attack
ATKHB	attack helicopter battalion
ATP	ammunition transfer point
att	attached
ATTN	attention
AUTODIN	Automatic Digital Network
AV	aviation
AVLB	armored vehicle launched bridge
AVTOC	aviation tactical operations center
AWACS	Airborne Warning and Control System
AWE	advanced warfighter experiment
AXP	ambulance exchange point
B	bulk
BADD	battlefield awareness and data dissemination
BAI	battlefield air interdiction
BAS	Battlefield Automation System
BAS	battalion aid station
base	A locality from which operations are projected or supported. An area or locality containing installations that provide logistics or other support. A unit or multiunit position that has a definite perimeter.

base cluster	Bases in the rear area grouped for rear battle or mission-related purposes. A base cluster has no clearly defined perimeter. A base cluster operations center (BCOC) is established to perform the coordination functions of the rear battle.
BCIS	Battlefield Combat Identification System
BCT	brigade combat team
BCV	brigade combat vehicle
BDA	battle damage assessment
BDA	bomb damage assessment
BDAR	battle damage assessment repair
BDCST	broadcast system
bde	brigade
bde/TF	brigade task force
BDR	battle damage repair
BESV	Bradley engineer squad vehicle
BFA	battlefield functional area
BGP	border gateway protocol
BHL	battle handover line
BIT	built-in test
block	A tactical obstacle intent used to integrate fire planning and obstacle effort to stop an attacker along a specific avenue of approach. Requires extensive obstacle effort and overwhelming direct and indirect fires. Obstacles must be tied into terrain and allow no bypass. The blocking intent is conveyed through the block graphics.
bn	battalion
bn/TF	battalion task force
BOC	battalion operations center
BOS	battlefield operating system
BP	battle position
BPV	battlefield planning visualization
breach force	A combined arms force task organized with the maneuver and engineer forces necessary to reduce lanes through an obstacle and pass initial assault forces through the lanes. The force is typically mobility heavy using maneuver or engineer forces. When made up primarily of engineers, the force must also be organized with the maneuver forces necessary for local direct-fire suppression and security at a local level. One of the three breach organizations.

BRIL	baseline resource item list
BRT	brigade reconnaissance troop
BSA	brigade support area
BSC	base support company
BSFV	Bradley stinger fighting vehicle
BSFV-E	Bradley stinger fighting vehicle-enhanced
BSO	brigade signal officer
BVTC	battlefield video teleconferencing
C	courier
C2	command and control
C2I	command, control, and intelligence
C2W	command and control warfare
C2V	command and control vehicle
C3	command, control, and communications
C3I	command, control, communications, and intelligence
C4I	command, control, communications, computers, and intelligence
CA	civil affairs
CAA	combined arms army
CAS	close air support
CASEVAC	casualty evacuation
CASREP	casualty report
CAT	combined arms team
CATK	counterattack
CAV	cavalry
cbt	combat
CCIR	commander's critical information requirements
CCL	combat-configured load
CCTV	closed circuit television
CD	collision detection
CDR	commander
CD-ROM	compact disc-read only memory

CEB clothing, equipment, and bath

CESO communications-electronics signal officer

CEV combat engineer vehicle

CFA covering force area

CFF call for fire

CFL coordinated fire line

CGS common ground station

CHD conservative heavy division

CHEMWARN chemical warning

CHS common hardware/software

CHS combat health support

CHSII common hardware/software—version 2

CIC command information center

CINC commander-in-chief

CIRCE Countermobility Remote Control System

Cisco Manufacturer's name for a commercial modular access router.

CIU crew interface unit

CL class

CLAMMS Cleared Lane Mechanical Marking System

Class I A category of supply which includes meals and rations.

Class III A category of supply which includes petroleum, oils, and lubricants.

Class IV A category of supply which includes construction and barrier materials.

Class V A category of supply which includes ammunition.

Class VIII A category of supply which includes medical material.

Class IX A category of supply which includes repair parts and components.

Class IV and V supply point The location of obstacle and survivability materials in the task force sector.

classes of supplies The grouping of supplies, by type, into 10 categories to facilitate supply management and planning.

clearing operations The total elimination of an obstacle or unexploded ordnance over a defined area. Normally, clearing is a sustainment engineer task conducted well after total elimination of all direct and indirect fires able to cover the obstacle. Clearing is an extremely resource intensive and slow operation and is typically assigned to provide general support to a higher unit.

CL IV & V REP class IV and V report.

CLS combat lifesaver

CM countermobility

CM/S countermobility and survivability

cmd command

CMREP countermobility report

CNR combat net radio

co company

CO commanding officer

co cdr company commander

COA course of action

COE common operating environment

CofS chief of staff

COLT combat observation lazing team

COM communications port

COMSEC communications security

control measures Directives given graphically through digital or manual means or orally by a commander to subordinate commands in order to assign responsibilities, coordinate fires and maneuver, and facilitate control during combat operations.

CONUS continental United States

COO combined obstacle overlay

COS center of sector

COSCOM corps support command

countermobility (CM) The use of obstacles and fires to attack the enemy's maneuver to the advantage of the defender. The combination of fires and obstacles create a vulnerability that friendly fires can exploit by fire, maneuver, or a combination.

countermine A subcomponent of mobility that concentrates solely on the actions taken to counteract a mine or minefield through detecting, reducing, or bypassing.

covert breach A breach tactic used when the force must reduce lanes through enemy tactical or protective obstacles undetected. Normally, the covert breach is used when mission success depends on achieving surprise at the expense of speed or mass.

CP	command post
CRT	combat repair team
CS	combat support
CSA	corps storage area
CSB	combat support battalion
CSE	combat support equipment
CSES	corps staff engineer section
CSG	corps support group
CSM	command sergeant major
CSMA	carrier sense multiple access
CSR	controlled supply rate
CSS	combat service support
CSSCS	Combat Service Support Control System
CST	company support team
CT	cipher text
CTIL	commander's tracked item list
CURSIT	current situation
D^{3}A	decide, detect, deliver, and assess
DA	Department of the Army
DAO	division aviation officer
DASB	division aviation support battalion
DATK	deliberate attack
DAWE	Division XXI Advanced Warfighting Experiment
DB	database
DBS	direct broadcast satellite
DCE	distributed computing environment
DDO	dynamic distributed overlay
DDS	Data Distribution System
defined target	Refers to the enemy whose ability to maneuver is the target of the obstacle and fire plan. The target is relative to the subordinate unit's force allocation ratio. An armored maneuver brigade conducting a prepared defense will fight an enemy's division. Maneuver battalions and companies in a prepared

defense will fight an enemy's brigades or regiments and battalion, respectively.

deliberate breach A breach tactic used when forces necessary for suppressing, obscuring, reducing, and securing a lane through an obstacle are beyond the capability of a subordinate unit. This type of breach requires one or more subordinate units to be task organized and assigned specific support, breaching, and assault responsibilities. A deliberate breach is characterized by centralized planning, preparation, and execution.

det detachment

DII COE defense information infrastructure–common operating environment

directed obstacle Obstacles directed by a higher commander as a specified task to a subordinate unit. Directed obstacles must always fall within the obstacle zones or belts designated by higher. They may or may not be part of the directing unit's belts or groups.

DISCOM division support command

disrupt A tactical obstacle intent to focus fire planning and obstacle effort to break up an enemy's formation, interrupt his time table, cause the premature commitment of breach assets, and piecemeal his attack. May be used to separate combat echelons or combat forces from their logistical support. The disrupt intent is conveyed through the disrupt graphic.

div division

DIVARTY division artillery

DIVEN division engineer

DIVEN MAIN division engineer main command post

DLIC detachment left in contact

DMAIN division main command post

DMC distribution management center

DMCO division movement control office

DMMC division material management center

DMS Defense Message System

DNVT digital nonsecure voice terminal

doctrinal template A model based on postulated enemy doctrine. It generally portrays frontages, depths, echelon spacing, and force composition, as well as the disposition of combat, CS, and CSS units for a given type of operation. It portrays how the enemy would like to fight if he was not constrained.

DOD Department of Defense

DP decision point

DREAR	division rear command post
DRS	Digital Reconnaissance System
DS	direct support
DSA	division support area
DSB	division support battalion
DSES	division staff engineer section
DST	decision support template
DSVT	digital secure voice terminal
DTAC	division tactical command post
DTED	digital terrain elevation data
DTD	digital topographic data
DTOC	division tactical operations center
DTSS	Digital Topographic Support System
DZ	drop zone
EA	engagement area
EAB	echelons above brigade
EAC	echelons above corps
EAD	echelons above division
EBA	engineer battlefield assessment
ECB	echelons corps and below
ECCM	electronic counter-countermeasures
ECM	electronic countermeasures
ECCM	electronic counter-countermeasures
EDM	enhanced data mode
EEFI	essential elements of friendly information
EFSP	engineer forward supply point
ELINT	electronic intelligence
e-mail	electronic mail

engineer battlefield assessment That part of the engineer's planning process that

(EBA)	complements the development of facts and assumptions during the mission analysis phase of the tactical decision-making process. EBA has three components: terrain analysis, enemy M/S, and friendly M/S capability.
engr	engineer
EO	engagement operations
EOD	explosive ordnance disposal
EOPS	engineer operations
EPLRS	Enhanced Position Location Reporting System
EPW	enemy prisoner of war
EPWREP	enemy prisoner of war report
equip	equipment
EVAC	evacuation
EVENTTEMP	event template
EW	electronic warfare
EWL	engineer work lines
EXFOR	experimental force
FA	field artillery
FAAD	forward area air defense
FAADC2I	forward area air defense command, control, and intelligence
FACE	forward aviation combat engineering
FARP	forward area rearm/refuel point
FASCAM	family of scatterable mines
FBCB2	Force XXI battle command brigade and below
FEBA	forward edge of the battle area
FFIR	friendly force information requirements
FH-M	frequency hopping-master
FH-MUX	frequency hopping-multiplexer
FIT	fault-isolation test
fix	A tactical obstacle intent to focus fire planning and obstacle effort to slow an attacker with a specified area, normally EA. Obstacle and fires are planned in depth and build with intensity to complete the enemy's destruction within the specified area. The fix intent is conveyed using the fix graphic.

FLC force-level control

fld field

FLOT forward line of own troops

FM field manual

FM frequency modulated

FMS force manning system

FOMAU fiber-optic medium attachment unit

force protection Countermobility, survivability, and security measures a commander uses to ensure the integrity of his force throughout an operation. Normally conducted in a LIC or in rear areas against a viable rear area threat.

forward aviation combat engineering (FACE) A mobility operation in which engineers perform missions in support of forward aviation ground facilities. Such missions include reconnaissance; construction of low-altitude parachute extraction zones, landing strips, and airstrips; and providing berms, revetments, and trenches for FARPS.

FRAGO fragmentary order

freq frequency

FRT forward recovery team

FS fire support

FSB forward support battalion

FSCL fire-support coordination line

FSCOORD fire-support coordinator

FSE fire-support element

FSLC forward-support logistics center

FSMC forward-support medical company

FSO fire-support officer

FTP file transfer protocol

fwd forward

FXXI Force XXI

G1 Assistant Chief of Staff, G1 (Personnel)

G2 Assistant Chief of Staff, G2 (Intelligence)

G3 Assistant Chief of Staff, G3 (Operations and Plans)

G4 Assistant Chief of Staff, G4 (Logistics)

G5	Assistant Chief of Staff, G5 (Civil Affairs)
G6	Assistant Chief of Staff, G6 (Communications)
GB	gigabyte
GBCS	ground-based common sensor
GBS	Global Broadcast System
GCCS	Global Command and Control System
GCCS-A	Global Command and Control System-Army
GCS	Ground Common Sensor
GIE	global information environment
GPS	Global Positioning System
grp	group
GS	general support
GSR	ground surveillance radar
HATK	hasty attack
HCU	high-capacity computer unit
HEMTT	heavy expanded mobility tactical truck
HF	high frequency
HHC	headquarters and headquarters company
HHD	headquarters and headquarters detachment
HIMAD	high-to-medium altitude air defense
HMMWV	high-mobility multipurpose wheeled vehicle
Hornet-PIP	anti-tank/anti-vehicular off-route munition-product improvement program
HPT	high-payoff target
HPTL	high-payoff target list
HQ	headquarters
HRP	highway regulating point
HRSS	high resolution support system
HS3	Hunter Sensor Surrogate System
HTF	how to fight
HUMINT	human intelligence
HVT	high-value target

hvy	heavy
I&W	intelligence and warning
ICCR	integrated circuit chip reader
ICO	Intelligent Combat Outpost
IDM	improved data modem
IDS	improved dissemination server
IEEE	Institute of Electrical and Electronic Engineers
IEW	intelligence and electronic warfare
IEWCS	intelligence and electronic warfare common sensor
IFF	identification friend or foe
IFV	infantry fighting vehicle
IG	inspector general
IHFR	improved high-frequency radio
IIPC	information/intelligence/plans cell
IIR	intelligence and information requirement
IKW	improved Kiowa warrior
IMETS	Integrated Meteorological System
IMF	intelligence minefield
IMINT	imagery intelligence
INC	internet controller
inf	infantry
info	information
INFOSEC	information security
INFOSYS	information system
in-stride breach	A breach tactic used when the assets needed to suppress, obscure, secure, and reduce a lane through an obstacle can be task organized into a subordinate unit. Normally used against lightly defended obstacles or when the situation is unclear. Planning centers around the allocation of resources to subordinates; breach execution is decentralized.
intel	intelligence
INTREP	intelligence report
INTSUM	intelligence summary

IO information operations

IP internet protocol

IPB intelligence preparation of the battlefield

IPX internet package exchange

IR information requirements

IREMBASS Improved Remotely Monitored Battlefield Sensor System

ISB intermediate staging base

ISYSCON integrated system control

JAAT joint air attack team

JSEAD joint suppression of enemy air defenses

JSTARS Joint Surveillance Target Attack Radar System

JTF joint task force

JTIDS Joint Tactical Information Distribution System

JTR joint tactical radio

KIA killed in action

km kilometer(s)

KMPH kilometers per hour

LAN local area network

lane A route through an enemy or friendly obstacle which provide a passing force safe passage. The route may be reduced and proofed as part of a breaching operation or constructed as part of a friendly obstacle. A lane must be 1 meter wide for dismounted column movement and 4.5 meters wide for single-lane column movement. A two-way mounted lane is 10 meters wide.

lane marking Those devices emplaced on a reduced and proofed lane that define the lane's entrance, exit, width, and path for the passing force. There are five types of markers used in lane marking:

Entrance/exit markers: Markers placed at the entrance and exit points of a lane defining the start or end of the reduced lane through the obstacle. They signify the point at which movement is restricted to the lane and the width of the reduced lane. Entrance and exit markers are visually different from all other lane markers.

Handrail markers: Markers used with entrance and exit markers that are placed at the left (related to the direction of travel) limit of the reduced lane. They clearly define the path of the lane through the obstacle and the width of the path. A lane may be marked with both left and right handrails, but as a minimum, a lane must be marked with a left handrail.

Funnel markers: Markers placed forward of the entrance or past the exit that augment the visual signature of the entrance and exit markers. They assist the passing unit in making final adjustments to their combat column before entering the lane.

Far recognition markers: A marker placed well forward of the lane entrance used to guide larger formations (battalion and above) to the breach site. Signifies the point at which passing forces begin a transition to combat column.

LBA	Longbow Apache
LC	line of contact
LCD	liquid crystal display
LCU	lightweight computer unit
LD	line of departure
LDR	leader
LEC	light equipment company
LEN	large extension node
LIC	low-intensity conflict
LINC	lightweight internet controller
LLDR	lightweight laser designator/range finder
LNO	liaison officer
LOA	limit of advance
LOC	lines of communication
LOC	Logistics Operations Center
log	logistics
LOGPAC	logistical package
LOGSITREP	logistics situation report
LOS	line of sight
LRAS3	long-range acquisition scout sensor suite
LRF	laser range finder
LRP	logistics release point
LRSD	long-range surveillance detachment
LRU	line replacement unit
LSD	large screen display
lt	light

LTIOV	last time information of value
LTO	logistics task order
LZ	landing zone
m	meter(s)
M/CM/S	mobility, countermobility, and survivability
M/S	mobility and survivability
MAINT	maintenance
MAINTCS	maintenance control section
MAS	main aid station
MB	megabyte
MBA	main battle area
MCOO	modified combined obstacle overlay
MCS	Maneuver Control System
MCS-ENG	Maneuver Control System-Engineer
MCSR	material condition status report
mech	mechanized
MEDEVAC	medical evacuation
METT-T	mission, enemy, terrain, troops, and time available
MF	minefield
MGB	medium girder bridge
MI	military intelligence
MICLIC	mine-clearing line charge
MIJI	meaconing, intrusion, jamming, and interference
MIJIREP	meaconing, intrusion, jamming, and interference report
MLRS	multiple launch rocket system
MO	magneto optical
MOB	mobility
MOBA	military operations in built-up areas
mobility	All aspects of an operation which provide the commander with freedom to maneuver and sustain combat power at the place and time of his choosing. In the context of BOS mobility, all aspects of an operation that attack the enemy's maneuver.

MOBREP	mobility report
MOPMS	Modular Pack Mine System
MOUT	military operations on urbanized terrain
MP	military police
MPN	MSE Packetswitch Network
MRB	multirole bridge
MRD	Motorized Rifle Division
MRR	motorized rifle regiment
MSB	main support battalion
MSC	major subordinate command
MSE	Mobile Subscriber System
MSF	maintenance support facility
MSN	MSE packet switch network
msns	missions
MSR	main supply route
MSRT	mobile subscriber radio terminals
MST	maintenance support team
MTC	movement to contact
MTOE	modified table of organization and equipment
MTS	Movement Tracking System
mvmt	movement
MVR	maneuver
NAI	named area of interest
NBC	nuclear, biological, chemical
NBI	nonbattle injury
NC	node center
NCA	National Command Authority
NCO	noncommissioned officer
NCOIC	noncommissioned officer in charge
NCS	net control station
NFA	no-fire area

NMC nonmission capable

no number

NRI net radio interface

NUCWARN nuclear warning

O/I operations and intelligence

O/O on order

obj objective

obscure The use of terrain, battlefield obscurants, or limited visibility to hamper the enemy's observation or target acquisition of friendly forces. In a breach operation, one of the four breaching fundamentals.

obstacle Any physical characteristic of the terrain (natural, cultural, man-made) that impedes the mobility of a force. Obstacles are categorized into two fundamental types:

Existing: Any natural or cultural attribute of the terrain that impedes a force's movement, such as go/no-go terrain, population centers, elevated railways/roadways, and waterways.

Reinforcing: Obstacles specifically constructed, emplaced, or detonated by enemy or friendly forces. Reinforcing obstacles are further categorized as tactical or protective obstacles.

obstacle belt A graphical obstacle control measure used by brigades to designate an area within an approved obstacle zone in which subordinate units are authorized to emplace tactical obstacles. Obstacle belts are designated with a specific obstacle intent that focuses the integration of obstacle groups within the belt to support the brigade scheme of maneuver. Normally, belts are allocated against regimental or brigade avenues of approach. Obstacle belts do not cross subunit boundaries one level down.

obstacle effect Conveyed through the use of graphics. Each symbol represents exactly how the enemy's maneuver should be altered. Refer to obstacle intent.

obstacle group An array of individual tactical obstacles within an obstacle belt whose combined effect accomplishes a single obstacle intent. Obstacle groups are planned by battalion-and below-sized forces against battalion-sized and separate company-sized avenues of approach. Obstacle groups are used to synchronize obstacle effect and overwatching direct or indirect fires. When more than one obstacle group is used within an obstacle belt, the sum effect of the groups must accomplish the intent of the obstacle belt. Graphically portrayed on the obstacle plan at task force and below using the obstacle intent graphics.

obstacle handover The transfer of responsibility for an obstacle between the emplacing and overwatching units.

obstacle intent Used by the maneuver commander to convey the effect obstacles and fires must have on an enemy's maneuver (disrupt, turn, fix, or block) and a relative location on the battlefield in which the intent is to occur. The intent defines the desired end state that must be achieved by fires and the obstacle to ensure success. The obstacle intent is part of all obstacle plans at brigade and below.

obstacle intent graphics Graphics that display the end state or overall purpose of the obstacle belt/group/zone.

obstacle plan A comprehensive, coordinated plan that integrates the use of tactical and protective obstacles to support a scheme of maneuver. The plan designates obstacle responsibilities, general location, directed/reserve obstacles, and special instructions. It is normally prepared as an annex to an OPORD or OPLAN at corps and below. Depending on the echelon, the plan may include obstacle control measures, location of directed/reserve obstacles, obstacle intent, priority, and associated obstacle restrictions. The plan may also include a consolidated obstacle target list.

obstacle restrictions Limits on the method, type, and location of obstacles authorized to be emplaced within an obstacle zone or belt. Allows the commander to preclude the use of obstacles which may impact on future operations. Obstacle restrictions are defined by belt or zone in the obstacle plan.

obstacle zones A graphical obstacle control measure used by division or corps to designate an area in which subordinate brigades or divisions are authorized to emplace tactical obstacles. Normally, obstacle zones are allocated against enemy divisional avenues of approach. Obstacle zones do not cross unit boundaries one level down.

OBSTINTEL obstacle intelligence

OBSTINTEL The plotting, reconnaissance, and analysis of the enemy's obstacle effort as part of the overall IPB and reconnaissance and surveillance effort. Includes obstacle location, orientation, composition, and integration with enemy direct- and indirect-fire plans.

OCOKA observation and fields of fire, cover and concealment, obstacles, key terrain, and avenues of approach

OIC officer in charge

OPCON operational control

OPFAC operational facility

OPFOR opposing force

OPLAN operation plan

OPORD operation order

OPS operations

OPSEC operations security

OPTEMPO operations tempo

OS over-watch sensor

P package

PA Public Affairs

PD point of departure

PERSITREP personnel situation report

PERSTATREP personnel status report

PIP product improvement program

PIR priority intelligence requirements

PL phase line

PLGR precision lightweight ground positions receiver

plt platoon

PLT LDR platoon leader

PMO provost marshal

POC point of contact

POL petroleum, oil, and lubricants

PP passage points

prep preparation

protective obstacle Used to protect a friendly force from the enemy's final assault onto the force's position. Protective obstacles are close to the friendly unit's defensive positions and are tied in with the supported unit's final protective fires.

PS personnel services

PSB personnel services battalion

PSC personnel services company

PSD personnel services detachment

PSG platoon sergeant

PSNCO personnel services noncommissioned officer

PSS personnel services support

PSYOPS psychological operations

PZ pickup zone

QRMP quick-response multicolor printer

qty quantity

R&S reconnaissance and surveillance

RAH66 reconnaissance attack helicopter (Comanche)

RAM random access memory

RAAMS Remote Antiarmor Mine System

RB ribbon bridge

RCP relevant common picture

rcvy recovery

RECON reconnaissance

REDCON readiness condition

reduce The creation of a lane through, over, or around an obstacle. In the case of minefields, refers to destroying, neutralizing, removing, or bypassing mines. In a breach operation, one of the four breaching fundamentals.

relative location Refers to the use of obstacle control measures on the battlefield.

REPL replacement

reserve obstacle Directed obstacles over which the commander restricts execution authority. The directing commander usually specifies the unit responsible for obstacle emplacement, handover, and execution. The commander must clearly identify the conditions under which the obstacle is to be executed.

RETRANS retransmission

RF radio frequency

RFA restricted fire area

RFI request for information

RFL restricted fire line

RII relative information and intelligence

RIU radio interface unit

ROE rules of engagement

ROM read-only memory

RP release point

rqr required

RRP replacement receiving point

RSR required supply rate

RTOC rear tactical operations center

/s/ signature

S&T supply and transportation

S support

S1 Adjutant (US Army)

S2 Intelligence Officer (US Army)

S3 Operations and Training Officer (US Army)

S4 Supply Officer (US Army)

S5 Civil Affairs Officer (US Army)

SA situational awareness

SALUTE size, activity, location, unit, time, and equipment

SAMS Standard Army Maintenance System

SARSS Standard Army Retail Supply System

SARSS-O Standard Army Retail Supply System-Objective

SATCOM satellite communications

SCATMINE scatterable mine

SCATMINEREP scatterable mine report

SCATMINEWARN scatterable mine warning

scatterable mine A mine laid without regard to classical pattern that is designed to be delivered by aircraft, artillery, missile, or ground dispenser or to be hand thrown. It will normally have a limited laid life.

SCC system control center

SEAD suppression of enemy air defenses

sect section

secure In a breaching operation, those actions that eliminate the enemy's ability to interfere with the reduction and passage of friendly combat power through a lane. Secure may be accomplished by maneuver or by fires. One of the four breaching fundamentals.

SEE small emplacement excavator

SEN small extension node

SENSREP sensitive items report

SES staff engineer section

SHELLREP shelling report

SHORAD short-range air defense

SICIPS standard integrated command-post system

SIGINT signal intelligence

SIGO signal officer

SIGSEC signal security

SINCGARS Single-Channel Ground-Airborne Radio System

SIPRNET Secret Internet Protocol Network

SIR specific information requirement

SIT situation

SITEMP situation template

SITREP situation report

situational awareness The ability to have accurate and real- or near-real-time information of friendly, enemy, neutral, and noncombatant locations; a RCP of the battlefield scaled to specific command levels of interest and special needs.

situational obstacle A tactical obstacle emplacement capability held in reserve. Execution is triggered by friendly actions, enemy actions, or a combination of the two, and it may be executed as a be-prepared or an on-order mission. The situational obstacle can only be used in an approved zone or belt and requires complete integration into the decision support template. Includes the full range of obstacle assets, not just scatterable mines.

SIV systems integration vehicle

SJA Staff Judge Advocate

SPF special-purpose forces

SPCL special

SPLASH A downed friendly aircraft report.

SPO support operations officer

SPOTREP spot report

SOCCE special operations command and control element

SOEO scheme of engineer operations

SOF special operations forces

SOI special operating instructions

SOP standing operating procedure

SOR special orders and requests

SOSR suppress, obscure, secure, and reduce

spt support

SRC standard requirement code

SSOC security and sustainment operations cell

sqdn squadron

ST self-test

ST special text

ST student text

STAMIS Standard Army Management Information System

STANAG Standardization Agreement

support force That force in a breaching operation whose mission is to eliminate enemy interference with the breach through application of suppressive direct and indirect fires. The support force missions include but are not limited to isolating the breach site by focusing overwhelming fires on enemy weapons systems overwatching the obstacle, preventing any repositioning or counterattack threatening the breach, controlling the use of indirect fires and obscuration, and softening the initial foothold on the objective. The support force is one of the three breach organizations used in breaching operations.

surg surgical

SUPREP supply status report

suppress The focus of all available fires on enemy personnel, weapons, or equipment to prevent effective fires on friendly forces. Suppressive fires include the full range of weapons from direct and indirect fires, ECM, and directed energy. The purpose of suppression is to protect forces reducing and maneuvering through the obstacle and to soften the initial foothold (assault force objective).

survivability The full range of measures taken by a commander to protect his force (personnel, equipment, and supplies) from an enemy's attack. Includes the use of fortifications, protective obstacles, strongpoints, camouflage, and deception to give the total force the edge needed to survive the battle.

SURVREP survivability report

sustainment engineering Those missions are task assigned to provide engineer units general support to a division or above that provide the force with troop construction, logistical facilities, LOCs, airfield damage repair, and obstacle clearing necessary for continuous combat operations. Normally these operations are confined to the rear area of divisions and above.

svc service

SYSCON system control

TA target acquisition

TAC tactical operations center

TACAIR tactical operations center air

TAC CP tactical operations center command post

TACFIRE tactical fire

TACON tactical control

tactical obstacles Those obstacles used to directly attack the enemy's ability to maneuver, mass, and reinforce in support of the force's direct- and indirect-fire lanes and tactical repositioning. When employed, individual tactical obstacles make up obstacle groups or directed obstacles. Tactical obstacles are numbered, using a 12-character alphanumeric designator.

TACSAT tactical satellite

TAI targeted area of interest

TAIS Tactical Airspace Integration System

TCF tactical combat force

TCP transport control protocol

TCU tactical computer unit

TDMP tactical decision-making process

TEM Terrain Evaluation Model

TF task force

TFOCA tactical fiber-optic cable

TGT target

TI tactical internet

TLP troop-leading procedure

TM team

TO theater of operation

TOC tactical operations center

TOE table(s) of organization and equipment

TOW tube-launched, optically-tracked, wire-guided

TPN Tactical Packet Network

TRADOC United States Army Training and Doctrine Command

trans transportation

trmt treatment

TSOP tactical standing operating procedure

TTP tactics, techniques, and procedures

turn A tactical obstacle intent used to integrate fire planning and obstacle effort to divert an enemy formation off one avenue of approach to an adjacent avenue in support of the scheme of maneuver. Requires well-defined mobility corridors and avenues of approach. The combination of obstacles and fires must be impenetrable at the point (apex) where the turn begins. Fire control must be planned to maintain pressure on the enemy throughout the turn and exploit his exposed flank. The turn intent is conveyed using the turn graphic.

TV television

UAV unmanned aerial vehicle

UAV-GCS Unmanned Aerial Vehicle-Ground Control Station

UHF ultra-high frequency

ULLS-A United Level Logistic Systems-Air

ULLS-G United Level Logistic Systems-Ground

ULLS-S United Level Logistic Systems-Supply

UMCP unit maintenance collection point

US United States

USAES United States Army Engineer School

USAF United States Air Force

USAR United States Army Reserve

USMTF Unites States message text format

UTO unit task orders

UXO unexploded ordnance

VMF variable message format

VREP Class V special report

VTC video teleconferencing

w/ with

WAM wide-area munition

WAN Wide-Area Network

WARNORD warning order

WFA warfighter associate

WIA wounded in action

WIN Warfighter Information Network

XO executive officer

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